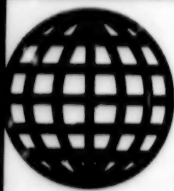**FOREIGN
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Scientists Group Supports Yavlinskiy in Parliamentary Elections

947A0029A Moscow POISK in RUssian No. 49, 10-16 Dec 93 p 1

[Article by Oleg Lezin: "The Club of Voters Attached to the Russian Academy of Sciences Storms Parliament"]

[Text] "Who is for whom?"—this question was this time probably the most interesting one in the absorbing game called "The Election Campaign." Shortly before the election the politically most active part of the academic community—the members of the Club of Voters attached to the Russian Academy of Sciences—decided to direct attention to their "party affiliation." A press conference was held in this regard at the Parliamentary Center.

Thus, with whom is the KIAN [Club of Voters attached to the Russian Academy of Sciences]? The club decided to support two blocs: the one headed by Yavlinskiy, Boldyrev, and Lukin, and Russia's Choice. Lyudmila Vakhnina, cochairman of the KIAN, noted that many scientists had displayed adherence to principles, having chosen in favor of Choice, in spite of the fact that they were in the social category which had suffered greatly during the reforms.

As Aleksey Zakharov, a member of the Coordinating Council of the club, explained at the press conference, this was done for the following reasons. Russia's Choice is the party of power, which needs constructive opposition. For the good of the reforms that are being implemented by it. Especially now, when in the structures of power there are forces that are trying to suppress any displays of dissidence. The alternative democratic bloc should become such opposition. The bloc of Yavlinskiy, they decided in the KIAN, will cope best of all with this task.

Moreover, it had not been possible to discover in the programs of any of the associations provisions in which science was specified as a sphere of state interest. The KIAN has a plan of the reform of science, and the bloc of Yavlinskiy had integrated it into its own program. In the opinion of A. Zakharov, the mistake of the reformers was that they, having indicated the necessity of state support of world-level research, did not propose a mechanism of its selection. As a result real transformations did not occur, while the financing of all research and development was merely cut back. The Club of Voters believes that the competitive financing of priority research in case of an independent examination and the creation of the appropriate legislative base should be at the basis of the new scientific and technical policy.

The support group of the bloc of Yavlinskiy from the KIAN gathered about 10,000 signatures of voters in support of the bloc, mainly at regional academic centers. Eight candidates from six regional organizations of scientists were placed on the ticket of the "Yavlinskiy-Boldyrev-Lukin Bloc" association, while Aleksey Zakharov was nominated for the State Duma on the federal part of the ticket.

We will report in subsequent issues on how successful the participation of the Club of Voters in the election was.

New Journal 'Science Compass' To Be Published

947A0029B Moscow POISK in Russian No. 50, 17-23 Dec 93 p 1

[Article under the rubric "The Journal Desk": "Waiting for THE COMPASS OF SCIENCE"]

[Text] In the next few months the international scientific publishing house Gordon and Breech intends to publish the new popular journal THE COMPASS OF SCIENCE. Initially it will be published every two months with a total size of 32 pages. It is anticipated that each issue will contain four or five main articles, as well as a collection of information notes on science news and advertising materials.

Prof. Gerhart Friedlender, a member of the U.S. National Academy of Sciences, has agreed to become the editor in chief of the journal. He works at Brookhaven Laboratory and is well known for his works in the field of nuclear physics and chemistry.

The list of its basic sections: physics and astronomy, chemistry, biology, the earth sciences, materials science, technology, applied mathematics and computers, power engineering and ecology, and medicine, testifies to the versatile nature of the future journal. Scientists from various countries will be the editors of these sections. Desiring to ensure the broadest possible coverage in the journal of the news of Russian science and striving to enlist our scientists in the description and analysis of their own achievements and the achievements of their foreign colleagues, the initiators of the publication of THE COMPASS OF SCIENCE additionally intend to include among the editors a representative of Russia—Academician Vitaliy Goldanskiy will be him. A Japanese scientist, apparently, will be another editor who represents a specific region.

In regard to the content, style, and format, among the closest analogs of the future publication it is probably possible to name the British journal THE NEW SCIENTIST. In the words of Prof. G. Friedlender, the goal of THE COMPASS OF SCIENCE will be "the description of the most important scientific and technical research, discoveries and ideas in such a form that their significance and content could be understood and appreciated by scientists of the most different specialties. In other words, the news of biology should be described in such a way that its importance and fascination would be clear to a specialist in solid-state physics, an anthropologist should read with interest about a new approach to the problem of stellar evolution, and so forth."

Russian scientists will probably find something to tell the readers of THE COMPASS OF SCIENCE about, and the world scientific community will find for itself in the new journal many interesting notices about the achievements of science in our country and assessments by our scientists of foreign science news.

Academy, Science Ministry at Loggerheads Over Budget

947A0029C Moscow SEGODNYA in Russian 11 Jan 94 p 10

[Article by Vladimir Pokrovskiy under the rubric "Opinions. Polemics": "The Academy Again Demands the Blood of Saltykov"]

[Text] From what we see on television and read in the newspapers we know that President of the Russian Academy of Sciences Yuriy Osipov is extremely worried about the financial situation of academic science and is particularly outraged by the fact that in the draft of the budget for 1994 the lifeline of Russian basic science—the separate line "Russian Academy of Sciences"—has disappeared.

Yuriy Osipov blames directly for the loss of the line two Borises—Minister of Finance Boris Fedorov and Minister of Science and Technical Policy Boris Saltykov. In the opinion of the presidium of the RAS [Russian Academy of Sciences], which on 14 December was set forth in the appeal of academicians to Boris Yeltsin, these two ministers are purposefully and systematically destroying the academy. The decree of the presidium of the RAS of 21 December contains the threat of the public impeachment of the mentioned Borises.

In the appeal to the presidium the indignant scientists propose to put an end to this disgrace, to transfer to the jurisdiction of the academy of sciences all basic research of the country, and to eliminate the Ministry of Science. This demand is being advanced by the leadership of the academy for far from the first time. But for the first time all this talk has been brought from the offices to the public at large. And, perhaps, for the first time the "immortals" are so close to the desired goal. The battle under the carpet has ended, war has been declared.

They are bombarding the Ministry of Science with angry telephone calls: "How could you? How dare you leave academic science without means for existence?" Deputy Minister Andrey Fonotov shrugs his shoulders in bewilderment. In his opinion, the panic arose due to a misunderstanding.

"We thought that this problem was over long ago. For the new dummy of the budget, in which this line existed, was sent out to all interested departments back during the summer. And not the academy, but we directed the attention of the Ministry of Finance to this detail. The draft was very poor, we sent it off with a large number of critical remarks, on 28 October the ministry agreed with our criticism, and the line about the academy was returned to its legitimate place. It is strange that Yuriy Osipov did not try to find out from the minister of science the true state of affairs before scribbling one denunciation after another."

But, to all appearances, the president of the RAS did not define more precisely the state of affairs because this was not in his interests. The available facts force one to suppose that he needed a panic precisely at this, post-election moment, when Boris Yeltsin had announced the coming reduction of the number of ministries and their staffs. Panic was needed around any problem, be it even a nonexisting one. It is hard for us to believe that the leaders of the academy for all their friendly relations with the president and prime minister of the country did not have access to the latest dummy of the budget.

But the facts are as follows. Back on 14 September Nikolay Malyshev, adviser of the president of Russia for science and education, sent Yeltsin a note, in which what the presidium of the RAS is now talking about was proposed—the transfer of all basic science to the jurisdiction of the academy and the elimination of the Ministry of Science. Then the dissolution of the parliament occurred, and the chair of Boris Saltykov for the first time in many months ceased to rock. The minister of science as a man of the Gaydar team during this period without a constitution was absolutely inviolable. As soon as the election concluded in the way we know, the note of Malyshev with the presidential resolution to "consider" lay on the desk of Yegor Gaydar.

The suggestions of Malyshev, taken separately, could hardly damage the ministry—the advanced accusations did not conform too much to reality. The ministry was accused of the inordinate inflation of staffs at the moment when staffs had been reduced appreciably—due to low wages people are now fleeing the Ministry of Science. The ministry was accused of working "in the old way" and of the fact that here they were not dealing with anything, except for "petty tutelage and the distribution of finances." But it is hard to call "petty tutelage" the establishment of new structures like the state science centers, which literally saved from collapse several tens of the largest scientific organizations of the country. It is hard to call work "in the old way" the development of a completely new method for us of distributing finances with the help of scientists themselves—the establishment of the Russian Basic Research Fund is meant. This fund, incidentally, in spite of all the criticism leveled at it, revived much stalled research. "Instead of complaining," one scientist said," we are not writing applications for grants."

At a pre-election meeting with scientists Boris Saltykov spoke about the establishment of a similar fund for humanities scholars, about a Technology Fund, and about the possibility of establishing a fund for the payment of $1,000 stipends to representatives of the scientific elite of the country. Now everything may end in failure.

Malyshev's proposals, which are supported by surprisingly similar proposals of the presidium of the RAS and have been multiplied by an exactly chosen moment, may thus overthrow the ministry that is hateful to the academy. According to information from the state apparatus, there is on the desk of Boris Yeltsin a document on the elimination of the Ministry of Science and the establishment in its place of a department for science. Which Malyshev, of course, is being appointed to head. Already a once former minister of science. For a whole month.

"The ministry in its present form is not the most ideal structure for the extrication of science from a state close to clinical death," believes Aleksey Zakharov, a member of the Russian Consultative Council of the International Science Foundation and an active supporter of reforms in science, whom one can sooner call an opponent than an admirer of the Ministry of Science. "They often and at

times quite justly criticize the ministry. Like any Russian department, it is very slow, and any innovation—be it a statute on the tax benefits of international charitable organizations on the establishment of a new fund—comes to it with extreme difficulty. However, this is the only department that is taking steps in the correct direction, which is not typical of the Soviet methods of management. If the ministry is eliminated and the financing of basic research leaves the academy, the only thing for Russian scientists to do is to put on their mourning clothes—the hopes for the improvement of the situation, which as it is are small, will decrease practically to zero. Practical experience has shown: The only thing that the leadership of the RAS can do effectively is to beg well for money. The presidium of the academy is not capable of carrying out reforms that make it possible to preserve the scientific potential, inasmuch as any of the reforms weakens its power. It is capable only of dragging out the agony and making it irreversible."

A short addendum to this article.

The poor Russian Academy of Sciences, which is constantly crying about budgetary support, for example, has at its disposal several joint ventures, including together with an Austrian firm—the five-star Palace Hotel. Another five-star hotel is located on the grounds of the Institute of Bioorganic Chemistry of the RAS, an automobile showroon also operates there. Where the considerable currency assets are going is unknown. In particular, during a check of the Palace Hotel $860,000 in uncollected cash, which belong to the academy, were discovered. One must think that scientists did not need it very much or it was put aside for a rainy day.

CHEMICAL INDUSTRY

Detonation of Miscible Explosive Systems of Oxidizer-Fuel Type

[Article by B. I. Arkhipov, M. N. Makhov, and V. I. Pepekin, Chemical Physics Institute imeni N. N. Semenov; UDC534.222.2+536.7]

[Abstract] Explosive systems of the oxidizer-fuel type appear to be most promising from the standpoint of increased explosive power resulting from the supplemental interaction of the decomposition products of the initial explosive system. This non-traditional approach to the development of explosive systems is based on the principle of increasing explosive power not by any direct increase of detonation characteristics, i.e. synthesis of newer more powerful individual explosive components, but by virtue of a chemical reaction in the Chapman-Juge zone, thereby providing for more complete flow of detonation processes and directing the evolved energy towards completion of useful forms of explosive action. The feasibility of this approach has been demonstrated in another work with the benzotrifuroxane-hexanitroethane system, where the overall explosive power exceed that of each of the individual components. In the present work experimental data are presented on heats of explosion, rates of detonation, and propellent capabilities of an oxidizer-fuel system consisting of bis-(2,2,2-trinitroethyl)nitramine with supplemental oxygen balance, and three types of fuels: a) octagon and benzotrifuroxane, b) an inert organic fuel consisting of lamp black and ultra-finely dispersed diamond, and c) an inorganic fuel consisting of finely dispersed aluminum of 4-10 microns particle size. It was demonstrated that addition of the additives results in increased detonation and propellent capability of the composition. References 2 (Russian).

Structure and Optical Properties of Cadmium Telluride Films, Obtained by Precipitation From Ion-Molecular Beam

[Article by P. A. Panchekha, V. I. Gnidash, V. N. Lyubov, A. N. Chernikov, S. I. Gladkov, and M. S. Zhubr, Polytechnical Institute, Kharkov; UDC539/264]

[Abstract] Cadmium telluride has been used successfully as an absorptive coating on polycrystalline solar cells and as a buffer coating on Si and GaAs single crystals used for growing epitaxial HgCdTe films. In both cases high requirements are imposed on the structure and optical properties of the CdTe films. A basic technological problem lies in getting a stoichiometric and structurally perfect film at the lowest possible substrate temperatures. From an analysis of previous work it was concluded that an "ideal" process requires use of a beam of precipitating atoms having an energy of 5-50 eV per atom in order to attain high surface mobility and formation of dense and structurally perfect films. A recent trend in ion technology utilizes beams of so-called intrinsic ions having a high degree of ionization (1-10 percent) and relatively low energies (100-500 eV per ion). In this connection, one of the most promising methods for preparing semiconductor films appears to be vacuum precipitation from an ion-molecular beam. In the present work a study was made of the effect of the energy from a beam of precipitated material on the structure and optical properties of ion-molecular beam precipitated films of CdTe on glass and single crystal silicon substrates. Optimum conditions for obtaining precipitates of fully texturized, mirror-smooth, and optically perfect films were determined, and the effects of various interacting mechanisms of the intrinsic ions with the condensate on the structure and optical properties of the resulting films are discussed. Figures 4; references 35: 8 Russian, 27 Western.

Adsorption Properties of Porous Polymer Porolas-SG-2T

[Article by I. A. Bardina, N. V. Kovaleva, Yu. S. Nikitin, O. P. Polyakova, and N. M. Shchepalina, Chair of Physical Chemistry; UDC543.544:543.51]

[Abstract] Polymeric adsorbents are now being widely used to concentrate trace quantities of organic compounds in the atmosphere and in water. Effectiveness depends greatly on the adsorptive properties of the adsorbents. In a previous work a study was made of the adsorptive properties of domestic porous polymers obtained by copolymerization of styrene with divinyl benzene, and Tenaks-GC (poly, para-2,6-polyphenylene oxide). These products were found to be lacking in uniformity of properties from lot to lot and having low resistance to heat. In the present work a study was made of the adsorption properties of Porolas-SG-2T, a new adsorbent prepared by copolymerization of ethylstyrene with divinyl benzene and derivatives of methacrylic acid. It has a specific surface of 270 m^2 per gram, 1.1 cm^3 per gram total pore volume, and 213 angstrom units average pore diameter. It was demonstrated that this adsorbent is more specific in interaction with the functional groups of simple esters, ketones, and especially n-alcohols, than Polysorb-1. This is evidently due to differences in the geometry and chemistry of the surfaces. The results indicate that Poroplas-SG-2T may be recommended for use as an adsorbent to concentrate high priority atmospheric contaminants. References 8: 4 Russian, 4 Western.

ANALYSIS, TREATMENT, MINING

Cast Tungsten-Molybdenum Steels for High-Pressure Equipment

[Article by A. F. Sofroshenkov, I. A. Sofroshenkov, S. L. Semenov, Sihe rian Metallurgical Institute; UDC 669.018.25:53. (092+096)]

[Text] This article presents data on cast fast cutting steels for the manufacture of high-pressure chambers and bed plate inserts for high-pressure equipment.

In the instrument industry , high-pressure chambers 35 mm in diameter are manufactured from VK6 alloy, and 72 mm chambers are made from R6M5 alloy. Bed plate inserts for high-pressure equipment are made from VK15 alloy. References 1 and 2 present basic data on the behavior of hard alloys and fast cutting steels in the synthesis of superhard materials. The study and industrial testing of cast molybde num alloys have shown that equipment manufactured from these alloys are completely functional and may replace hard alloys. 3

The metal under study was obtained in a high-frequency induction furnace and poured into bars and rods.[4] The characteristics of the metal were studied after casting, annealing, hardening, tempering, and chemical-thermal processing. Cast metal costs less and has increased impact-fatigue durability compared to deformed metal. Cast steel R4M6S is chara cterized by the following chemical composition: 1.2-1.6% C, 4.8-5.2% Cr, 6.0-6.5% Mo, 1.2-1.4%Si, 1.2-1.7% V, 3-4%W; st eel R4M6K5S also contained 5% Co. Samples were also manufactured for study from a steel of this composition with the addition of 0.06-0.12% Ti and the same amount of rare-earth metal.

Cast steel has a porous structure with a carbide eutectic along the edges of the grains, at the base of which lies the complex carbide Me_6C. There are differing opinions about the effect of silicon on the carbide phase.[3] The silicon grinds down the grain and increases the hardn ess of the steel. The tungsten and molybdenum content in the α-phase is not increased due to their displacement from the carbides. The silicon reduces the amount of residual austenite; consequently, after hardening, steels R4M6S and R4M6 had residual austenite contents of 28-31% and 33-36% respectively. The silicon reduces the hardening and tempering temperatures by 10-15°C. An increase in carbon content in the steel leads to an increase in carbide phase, the hardness, and the formation of carbide Me_2C.

The formation of carbides in tungsten steels is more intense than in molybdenum steels, and the high carbon content in tungsten-molybdenum steels is desirable. The addition of rare-earth metals makes it possible to obtain new steel qualities: the rare-earth metals cause the grains to be ground down through the effective formation of nucleation centers. The effect of rare earth metals on hardness, residual austenite, and the impact viscosity of tungsten-molybdenum steels is similar to their effect on molybdenum steels.[3] The temperature α -γ of transformations in tungsten-molybdenum steels is lower than in tungsten steels.

The compression yield limit was determined by loading and unloading with measurement of the residual deformation. In steels with cobalt, silicon and a high carbon content, the temperature of the formation of ledeburite was reduced; consequently, the hardening temperature of these steels was lower than in steels without cobalt, silicon, and with a low carbon content.

To establish the annealing temperature, the critical points Ac_1 and Ar were determined; the temperature of isothermic annealing is 840-860°C and 720-740C. In annealed steels the carbide phase consists of complex carbides of tungsten, molybdenum, chromium, and vanadium. The microhardness of the tungsten carbides is 12,450-15,500 MPa. The basic properties of the steels are as follows.

Steel	σ_T	σ_C	KSU,	HRC	Thermal
	MPa	MPa	MJ/m^2		shock resistance, °C
R4M6S[*]	3100-3200	3200-3400	0.15-0.20	66.5-6 7.5	630
R4M6K5S[*]	3400-3500	3800-4000	0.15	66.5-68.5	635
R4M6K5S	3300-3400	3700-3 800	0.10-0.15	65-66	630
R4M6S	3000-3050	3200	0.10-0.15	64-65	625
R4M6	2500	2650	0.1 0	63-64	620

[*]Steels with rare earth metals and titanium.

To optimize the hardening and tempering, samples of different sizes and shapes were used. Hardening was done at 1190-1240°C in air, in oil, and after is othermic curing at 480-620°C. Direct hardening in oil leads to the formation of cracks in the transition to thin cross sec tions. Hardening in air did not provide uniform hardness. Gradual hardening eliminated the formation of cracks and provided a high level of hardness. Due to the formation of the carbide phase in isothermic curing, the amount of residual austenite was reduced and was 30% in steel R4M6S as opposed to 35% for hardening in oil. Approximately the same was found in other brand s of steel.

After hardening from optimal temperatures, the structure was porous with a carbide eutectic at the edges of the grains. An increase in hardening temperature led to a reduction in hardness, but the growth of the actual grain remained virtu ally unchanged due to the effect of the ledeburite eutectic, which slowed the growth of the grain.

In the cast state, after annealing the amount of carbide phase in R4M6S steel was 20-21% with up to 92% tungsten, molybdenum, and vanadium and 50% chromium. The ferrite contained 50% chromium and a very small amount of the other alloy components. In cobalt steels virtually all the

cobalt was in a solid solution and had no effect on the carbide phase In the hardened state some of the carbon a nd alloy components entered the solid solution. The martensite contained up to 0.0% C, 2.8-3.7% W, 3.6-4.8% Mo and virtually all the chromium and cobalt. Stable vanadium carbides hardly entered the solid solution.

Tempering done at 530-620°C made it possible to obtain a HRC hardness of 63-68.5 depending on the steel composition. Steels hardened from optimal temperatures after triple tempering for one hour at 540-560°C had the maximum hardness. The microstructure of the tempered steels consisted of martensite, carbides, and a small percentage of residual austenite. The structure of the tempered steels contai ned 26-30% excess carbide phase. Increasing the hardening temperature above the optimal temperature led to an increase in the degree of alloying of the α phase. The fine-disperse vanadium carbides which were formed in tempering were near the grain edges.

Testing of the steels for stabilization of the austenite showed that untempered samples became stable in 4-8 hours in the area of the martensite transformation. To avoid austenite stabilization, parts should be tempered immediately after hardening.

In order to increase the operating capacity of chambers and protect them from the effects of high temperatures, they were subjected to boronizing in the smelt stage at a temperature of 950-1000°C for eight hours. After boronizing the chambers were placed in a bath for final quenching and after curing they were gradually hardened with subsequent triple tempering. The structure of the boronized layer was spiny, in contrast to deformed steels with a granular structure.[5]

Industrial testing of the set of high-pressure chambers and bed plate inserts of cast tungsten-molybdenum steels for high-pressure equipment revealed a stability no lower than that of hard alloys. The chambers and equipment that had undergone boronizing had a higher stability. The R4M6S and R4M6K6S steels alloyed with rare earth metals exhibited a rather high stability.

Conclusions. Cast tungsten-molybdenum steels with rare-earth metals have a high level of hardness, are durable, and are thermal shock resistant. Transformations which occurred during thermal processing were studied. The main properties of the steels and the annealing, hardening, tempering and boronizing processing of the steels were determined. The experimental steels withstood the cyclic loading described above and were found to be suitable for the manufacture of high-pressure chambers and bed plate inserts used in the synthesis of ultrahard materials.

BIBLIOGRAPHY

1. A. F. Sofroshenkov, A. V. Khegay, N. M. Panina, IZV. BUZ. CHERNAYA METALLURGIYA No. 8, 1987 pp 85-88.

2. A. F. Sofroshenkov, IZV. VUZ. CHERNAYA METALLURGIYA No. 10, 1 990 pp 83-85.

3. A. F. Sofroshenkov, A. V. Khegay, S. L. Semenov, I. A. Sofroshekov, IZV. VUZ. CHERNAYA METALLURGIYA No. 6, 1991 pp 95-97.

4. A. F. Sofroshenkov, N. M. panina, A. V. Khegay, A. S. 1498813 USSR. Steel, and OTKRYTIYA. IZOBRETENIYA No. 29 , 1989 p 86.

5. A. F. Sofroshenkov, N. M. Pannina, IZV. VUZ. CHERNAYA METALLURGIYA No. 2, 1986 pp 69-72.

Identification and Optimum Control of Fuzzy Dynamic Systems

[Article by R.A. Aliyev and G.A. Mamedova (Azerbaydzhan State Petroleum Academy, Baku, Azerbaydzhan) under the "System Control Using Incomplete Information" rubric]

[Abstract] The objective of the article is to develop methods for identification and optimum control of fuzzy systems and using the methods in an existing coking process. Equations for identification of fuzzy functional and dynamic systems are derived. Theorems on the exact solution of fuzzy equations are given (without proof). Equations describing optimum control of fuzzy dynamic systems are presented. The results were used for identification and optimum control of a coking process (processing of heavy residual oil for producing oil coke). The method proposed for systems described with fuzzy difference equations is based on minimizing a fuzzy functional using regular and expanded arithmetics operations. To solve identification problems for systems described with fuzzy relational equations it is proposed to use an identification method based on exact solution of fuzzy relational equations. The method for optimum control of systems with a fuzzy criterion is based on modification of a fuzzy analog of the dynamic programming method for deterministic systems with fuzzy control restrictions. The proposed method was used for developing a fuzzy model of the coking process and for stating and solving the problem of termination control of the coking process. References 6

Iteration Algorithms of Segmentation of Multidimensional Images

[Article by V.M. Lisitsyn, K.V. Obrosov, N.N. Pasechnyy and V.A. Stefanov (GosNIIAS, Moscow)]

[Abstract] The article examines a method for segmentation and analysis of a class of multidimensional images characterized by a statistical relationship between the observed value of one component and validity of the estimate of the value of another component. Such relationsip is typical for multi-dimensional speckle images formed using remote sensing means. The proposed method makes it possible to use a common approach to the segmentation procedure, regardless of peculiarities of physical processes of formation of analyzed images. A formula for the decision rule for image segmentation based on the maximum a posteriori probability criterion in the case of a normal distribution of parameter estimates is derived. The algorithm output is not only a segmented image, but also characteristics of each identified area, so the algorithm makes it possible to analyze the initial scene. Figures 6, references 16.

System for Automated Formation of Image of Antiaircraft Missile Complexes

[Article by L.V. Vishnyakova and V.I. Kukhtenko (GosNI-IAS, Moscow) under the "Complex Technical Systems" rubric]

[Abstract] The first stage of a system for computer aided design of short range (5 to 25 km) anti-aircraft missile complexes (AMCs) is described. The system methodology is based on using the body of mathematics of the theory of operations in conjunction with the automatic control theory the theory of large systems. The problem of developing a short range AMC is stated and solved for the developmental design proposal stage. The process of computer aided design of an anti-aircraft complex includes sequential solution of problems of synthesizing the AMC image and analysis of resulting AMC configurations. The article describes the structure of the CAD system, as well as its hardware and software. The software for simulation of the AMC and its major subsystems is also described in great detail. The AMC CAD system was used for a number of practical calculations investigating the prospects for development and analysis of effectiveness of various configurations of a short range AMC. The use of the AMC CAD system made it possible to substantially increase the number of alternative AMC versions analyzed during the development process, which improved the quality of the design output. The system can be used by a research engineer who does not know programming languages but knows AMC design methods and procedures. Figures 13, references 23.

Spatial Filtration of Holographic Lateral-Shear Interferograms

[Article by V.G. Gusev, Tomsk State University imeni V.V. Kuybyshev, Chair of Optoelectronic Systems and Long-Distance Sounding; UDC 778.38]

[Abstract] Formation of lateral-shear interferograms by double-exposure holography is examined and spatial filtration enhancing the interference immunity of this process is proposed, a diffusely scattered field being used for monitoring wave aberration of lenses and objects. Objects with larger focal lengths require larger-size and thus less interference-immune holographic apparatus, the purpose of spatial filtration being to overcome the resulting difficulty. In the first exposure a matted screen the incident converging beam of coherent light has a quasi-spherical waveform with a radius of curvature equal to the distance d_1 from the monitored lens L_1 with a focal length $f_1 > d_1$) and the hologram of diffusely scattered field monitoring this lens is recorded by a quasi-plane reference wave. Then,

prior to the second exposure, the matted screen is shifted in its plane through a distance z along say the x-axis axis and the monitored lens is shifted in its principal (x_2, y_2) plane in the same direction through a distance equal to zf_1/d_1. Reconstruction of the thus recorded double-exposure hologram with a copy of the reference wave gives rise to a diffraction field whose complex amplitude is describable in the Fresnel approximation. The amplitude distribution of this field will be modified by placement of a filtering second lens with a focal length f_2 in the plane of the hologram. Its new distribution indicates that the subjective speckle fields appearing as a result of two exposures will coincide in the plane in which the image of the matted screen is formed. Such double-exposure holograms were recorded experimentally with 630 nm light from a He-Ne laser on Micrat BRL photographic plates, the focal length of the first lens being varied over the 180-500 mm range and that of the second lens over the 15-30 mm range. Figures 4; references 7.

Synthesis of Magnetic System for Magnetic Resonance Imager

[Article by P.A. Galaydin, A.I. Zamyatin, and V.A. Ivanov, Institute of Precision Mechanics and Optics, Chair of Radio Apparatus Design and Manufacture, St. Petersburg; UDC 621.318.4]

[Abstract] Synthesis of an optimum magnetic system for magnetic resonance imagers is considered, namely maximizing the size of the region of a highly uniform polarizing magnetic field with the minimum number of coils having equal inside diameters and carrying currents of the same density. The conventional method of such a synthesis is expanding the magnetic induction into a Taylor series and subsequently selecting system parameters which minimize several first terms of the series so as to ensure that the deviation from field uniformity will not exceed typically the 10^{-5} % order of magnitude. Regions with smaller deviation are obviously smaller. A fourth-order and thus simplest magnetic system consisting of two Helmholtz coils is inadequate for this application, because the region with an even larger (10^{-4} %) permissible deviation from field uniformity is too small. In use are now a sixth-order magnetic system of four coils (U.S. patent No. 4276529, 1981), compensated solenoids with a sixth-order outside groove (Ravi Kumar and P. Chaddan in Cryogenics Vol. 27, 1987), and an eighth-order magnetic system with three circuits (FRG patent No. 35 17818). Even in these systems is the region of uniform magnetic field still not large enough, unless they have a large inside diameter but then so is their weight and power requirement. A better alternative is shown to be a tenth-order magnetic system with only three equally spaced solenoids having equal inside diameters and wound with rectangular conductors, a longer one with a smaller outside diameter between two identical shorter ones with larger outside diameters along the common axis. The method of Taylor series expansion is applied here to the longitudinal component of magnetic induction at any point a distance z away from the axis of a solenoid with an inside radius R and a length L. The geometry of the central solenoid is characterized by two dimensionless parameters a_1, b_1. The two lateral solenoids are regarded as the difference between two solenoids with dimensionless geometrical parameters a_2, b_3 and a_2, b_2 respectively. Such a magnetic system is thus characterized by five dimensionless design parameters. With the value of a_1 (or any one of the other parameters) specified, the other four are evaluated as polynomial functions of that one. This has been done numerically for $a_1 = 1.1$, with each of the other four parameters expressed as complete fifth-degree polynomial in $a_1 - 1$ with a free term each. On this basis has been built a resistive MR imager with a two-loop water cooling system. The solenoids are wound with tubular rectangular conductors, the central one having 10 layers of 72 turns and each lateral having 14 layers of 29 turns, for a nominal magnetic induction of 0.1 T and an operating current of 111 A. The inside diameter and the total length are 71 cm and 176.8 cm respectively, the larger outside diameter being 87.3 cm. The diameter of the active region with a less than 10^{-5} % deviation from field uniformity is 52 cm. The imager weighs 800 kg and draws a power of 39 kW.

Multiple Identification of Optical Readings in Multi-sensor Information and Measurement System

[Article by S.A. Ivanovskiy and A.A. Pervozvanskiy, St. Petersburg State Electrical Engineering University imeni V.I. Ulyanov (Lenin), Chair of Software and of Computer and Calculating Systems Application; UDC 621.37: 621.391]

[Abstract] An information and measurement system is considered which includes K_o observers, each with K_s opto-electronic scanners on board moving in space. A set of objects is assumed to be moving in space in a known manner, some of them having been already observed earlier and the pertinent data recorded in a special catalog. The remainder of them has not yet been logged. The observation time is subdivided into into equally long periods. It is furthermore assumed that, by a preliminary processing of the readings taken by one scanner, it is possible to estimate the state vector of a given object at the beginning of an observation period and evaluate the covariance matrix of the estimation error. There arises the problem of identifying the readings, namely of referring each to objects in the catalog or to one of the new objects, or to the set of spurious ones. Because an object can give more than one reading, it is expedient to tackle this problem by solving the relevant sequence of destinations problems where the set of readings taken within one observation period has been broken down into those three subsets and each of the identification hypotheses defined accordingly. The problem of identifying the set of readings taken within one observation period can thus be reduced to the problem of maximizing a certain functional which is defined on the set of all hypotheses and is proportional to the probability of the given one. The exponential dependence of the total number of hypotheses on the number M of measurements and on the number N of objects already in the catalog makes the identification problem so unwieldy that complete sifting through the hypotheses is not always feasible. A simpler procedure is, therefore, proposed: sifting the hypotheses in two stages,

with fewer hypotheses to be sifted in each stage. In the first stage the entire set of known objects is subdivided into groups ("clusters"), namely into components of connectedness on a bilobate graph where the vertices represent all known objects and readings. Arcs are drawn to connect vertices when distances between them are smaller than a given threshold length. In the second stage the series of identification problems is solved separately for each cluster. Because one object can give more than one reading, a heuristic multistep algorithm is required for this procedure. The cost matrix in the destinations problems is best evaluated by the Monte Carlo method. The proposed procedure was tested on the following practical case: $N = 2K_oK_s$, number of objects detected within one observation period $N_o \approx 0.1N$, number of objects detected by several scanners $N_{(ss)} \approx 0.1N$, one scanner detecting 1-10 objtecs, number of scanners which detect objects during an observation period $K_d \approx 0.1K$, number of new objects $N_n \approx N$. References 3.

Method of First Integrals in Synthesis of Optimal Control

[Article by V.M. Lipatov, Bolshevo; UDC 519.3]

[Abstract] Synthesis of optimal control, being a dynamic problem of optimization, is solved in closed form for an autonomous control system in the general case of a nonlinear one with an additive re-entrant control vector $dx/dt = f(x(t)) + Bu(t)$. It is assumed that the mechanical control object $i(x(t))$ has a vector of independent first integrals which obeys Pontryagin's principle condition and that the control vector is subject to an upper-bound constraint on its Euclidean norm. With $x(t(0))$ and $x(t(1))$ given in the phase space, the problem is to find the structure of operator $u^0 = u^0(x(t))$ which will minimize the time functional $\Phi = {}_{t0}Int^{t1} dt = t(1) - t(0)$ to $\min \Phi = T^0(x(t))$. The solution to this variational problem is sought on the basis of the characteristic optimality condition in the quick-response problem. That minimum and thus optimum value is shown to depend not only on the vector of optimal control but also on the intrinsic motion of the control object (solution to the problem) under specific initial or current conditions in phase coordinates. The characteristic optimality condition is applied to the case of an object either in intrinsic motion or at rest, with a zero Euclidean norm of the control vector and no a'priori information about control of the object before time t_0. A partial differential equation of the Hamilton-Jacobi kind and the solution to its Cauchy problem with a zero boundary condition are obtained for T^0. For autonomous systems that equation is a quasi-linear first-order partial differential one solvable by the method of characteristics, the latter being solutions to a system of ordinary differential equations. In the particular case considered here the integral surface degenerates into an integral curve, the tangent plane into a tangent line, and the Monge cone into a Monge axis. As a specific example is considered motion describable by the system of two equations $dx(1)/dt = x(2) + u(1)$ and $dx(2)/dt = -x(1) + u(2)$ with the same upper-bound constraint on the norms of both control vectors. References 6.

On Possibility of Using New Types of Acoustoelectric Waves in Acoustoelectronic Integrated Circuits

[Article by A.K. Morocha, Moscow Electronic Engineering Institute; UDC 621.382]

[Abstract] The existence of purely transverse acoustic waves along the boundary of two isotropic half-spaces first described in *Akusticheskiy zhurnal* Vol. 24 No. 4, 1978 is discussed, and it is noted that if both half-spaces are piezoelectric crystals, a purely acoustoelectric wave may propagate along their acoustic contact boundary without an intermediate layer. An attempt is made to demonstrate that a new type of purely transverse wave may propagate parallel to the acoustic contact planes of two piezoelectric 43m crystals whereby the acoustoelectric field is localized in the near-contact layer whose thickness is on the order of the wavelength, i.e., the wave amplitude attenuate on either side of the contact boundary equally as fast as in ordinary Rayleigh waves. The structure of the purely acoustoelectric Stonley wave is plotted. The source data and the outcome of acoustoelectric parameter analysis of the new type of purely acoustoelectric waves for such contacting piezoelectric crystal pairs as GaAs with $ViGeO_{20}$, InSb with InAs, $ViGeO_{20}$ with ZnS, $ViGeO_{20}$ with InAs, GaAs with Si, ZnS with Si, and $ViGeO_{20}$ with Si are summarized. It is shown that the use of the new type of purely acoustoelectric waves whose existence is predicted in the article may be promising in monolithic integrated acoustoelectronics for developing functional devices with a latent acoustic channel, e.g., active and passive acoustic waveguides without losses, multilayer delay lines, acoustoelectric amplifiers and generators, convolvers, etc. Figures 2; tables 2; references 4: 2 Russian, 2 Western.

Selective Polymer Dissolution and Polymer Resist Relief Evolution

[Article by S.A. Zhogov, R.Kh. Timerov, Moscow Electronic Engineering Institute; UDC 621.382]

[Abstract] The inadequacy of the semi-empirical simplified models used to describe the resist relief evolution for simulating submicrometer lithography due to the assumption that the local polymer resist dissolution rate depends only on the mean value of the polymer's molecular mass prompted a new look at the process of selective polymer dissolution. In so doing, resist development is considered as a selective polymer dissolution process, and the diffusion origin of the selective polymer dissolution process, mass transfer in the polymer-gel-liquid solution system with selective dissolution, and nonselective dissolution are examined in detail. The concentration distribution evolution of monodisperse polystyrene in methylethylketone in a film, the development profiles of polymethylmethacrylate (PMMA) in methylisobutylketone (MBIK) and of polystyrene in methylethylketone, and the dependence of the critical groove size in the swelling polystyrene (PST)-methylethylketone (MEK) system on the initial polydispersity degree are plotted; the above description of selective polymer dissolution as an evolution of the spatial molecular and mass distribution (allowing for the dependence of the transport properties of the macromolecules on their size) makes it possible to simulate the process of slightly (PMMA-MIBK) and highly (PST-MEK) swelling polymer resist composition development and shows that the proposed model is suitable for describing the development process with the fullness required by submicrometer lithography. The findings demonstrate that by properly selecting the molecular and mass distribution of the polymer base, one can increase the resist composition resolution. Figures 4; references 8: 6 Russian, 2 Western.

Composite Field Effect Transistor With Barrier Junction and its Applications in Digital Integrated Circuits

[Article by V.I. Staroselskiy, V.A. Bratov, V.I. Suetinov, Moscow Electronic Engineering Institute; UDC 621.382]

[Abstract] The principal active element of GaAs integrated circuits—a field effect transistor with a Shottky barrier or p-n junction serving as the control barrier junction—is described, and the constraints imposed by the presence of the gate-source barrier junction are discussed. A method is proposed for limiting the gate current in field effect transistors with a barrier junction which amounts to using a composite transistor produced by inversely connecting the gate and source electrodes of two like transistors whereby the auxiliary transistor is connected to the gate circuit of the main transistor so that when the composite transistor's gate-source voltage rises, the main transistor's gate-source voltage rises but the auxiliary transistor's gate-source voltage decreases; the auxiliary transistor is cut off before a measurable current appears in the main transistor gate circuit under certain conditions. The use of composite FETs makes it possible to expand the functional capabilities of digital IC logic elements and lower their electric power consumption; their shortcomings include a certain decrease in response speed due to the use of additional auxiliary transistor elements in the switched transistor gate circuits. This drawback is partially compensated for by the bootstrap effect and automatic negative voltage level limiting. Figures 4; references 4.

Effect of Rare Earth Elements on Solid Phase Epitaxial Recrystallization Rate in Amorphized Silicon Layers

[Article by A.A. Balychenko, K.A. Iskhakov, V.S. Kulikauskas, V.V. Makarov, A.N. Shokin, Submikron Scientific Research Institute; UDC 621.382]

[Abstract] Recovery of the amorphized silicon crystal lattice at an annealing temperature below the melting point by the solid phase epitaxial recrystallization mechanism (TFER) and the attendant complex processes of impurity atom redistribution and embedding, point defect and capture center generation, etc., are discussed, and an attempt is made to examine solid phase epitaxial recrystallization in amorphized silicon layers with ion-implanted

Sm and Yb. These rare earth metal (RZE) impurities were selected due to their low solubility in silicon and, consequently, the low concentration of active atoms. KDB-12 <100> Si slices were used as the source material, and $^{152}Sm^+$ and $^{174}Yb^+$ ions were implanted in a Vezuviy-5 unit. The samples were annealed in an atmosphere of nitrogen. The solid phase epitaxial recrystallization processes were studied by the methods of Rutherford's backscattering (ROR) using primary $^4He^+$ ions with a 1,500 keV energy and secondary ion mass spectrometry (VIMS) in an IMS-3F unit; the backscattered ions were recorded by a solid state semiconductor detector with a 17 keV energy resolution, and the primary O_2^+ ion beam with an 8 keV energy and 1-2 µA current was scanned into a 0.5x0.5 mm pattern. Rutherford backscattering spectra and Sm and Yb concentration profiles in ion-implanted Si samples are plotted, and the ion implantation and heat treatment conditions are summarized. The study shows that after the heat treatment, the impurity distribution is characterized by three types of peaks; on the surface, slightly off-surface in the case of incomplete recrystallization, and on the boundary between the amorphized layer and crystal substrate. The effect of impurities on the recrystallization rate, i.e., the solid phase epitaxial recrystallization front velocity, is examined: given a 470°C annealing temperature, it is equal to 0.9+/-0.1 nm/min for Sm and 1.7+/-0.1 nm/mm for Yb, which is grater than that of Si^+-implantation by three- and sixfold, respectively. The characteristics of ion-implanted rare earth elements in Si during heat treatment may be used in semiconductor technology for producing heat- and radiation-resistant semiconductors, getter areas, small p-n-junctions, and other applications. The authors are grateful to Yu.A. Klimov for constructive discussions. Figures 4; tables 1; references 8: 6 Russian, 2 Western.

On Issue of Random Moving Surface Shadowing

[Article by V.Yu. Karayev; UDC 519.25]

[Abstract] The proliferation of ship-borne and coastal radar (RLS) used at very low grazing angles resulting is surface shadowing in addition to space and airborne radar operating at medium and small angles of incidence and the shortcomings of existing approaches of solving the problem of echo signal spectrum at small grazing angles prompted the development of a new approach which is suitable for finding any statistical characteristic of a random moving surface allowing for blockage. The approach is first tested on a simple model and then applied to the case of sea waves. The approach thus makes it possible to treat the undulating sea surface as a superposition of traveling plane waves with random amplitudes and determine its effective statistical characteristics. Since available computer facilities are too slow and inadequate for parallel calculations, the new approach is based on taking blockage into account for each term, than adding up the results. The proposed algorithm is a combination of precise and approximate approaches and makes it possible to consider moving surfaces and find any statistical characteristic allowing for blockage as well as plot the distribution function, resulting in a precise solution. It is expected that the algorithm will be used to find the spectrum

of the echo from the sea surface at small grazing angles. The author is grateful to M.B. Kanevskiy for constructive discussions. Figures 5; references 11: 10 Russian, 1 Western.

Polarization Characteristics of Radiothermal Emission of Earth's Covers at Millimeter Wavelengths

[Article by L.F. Chernaya, A.Yu. Zrazhevskiy; UDC 621.371.029.65]

[Abstract] The importance of understanding the radiothermal radiation characteristics of the earth's covers in the millimeter wavelength band (EHF) in a number of applied tasks of natural resource management and remote sensing by radiophysical methods prompted a study of the quantitative effect of the surface irregularities, dielectric constant, and atmospheric conditions on the polarization characteristics of radiothermal radiation of the earth's covers without vegetation. To this end, an analytical procedure is developed, and the effective temperatures of exposed soils are calculated for horizontal and vertical polarization as a function of the wavelength, relative bulk moisture content, and averaged geometrical parameters of these underlying surface irregularities for the pure atmosphere and planostratus clouds. The effect of bulk scattering in the EHF band is ignored, and uniform, generally flat, horizontal surface segments covered by chaotic irregularities whose dielectric constant does not depend on the coordinates are considered assuming that the size of the segment forming the emitted field greatly exceeds the correlation radius of the irregularity height while the radiating atmosphere is a uniform horizontal formation. The dependence of the effective soil temperature on the zenith angle and relative bulk moisture content and the dependence of the sandy soil's polarization invariant on the zenith angle are plotted. The findings make it possible to determine the relative effect of various factors on each cover's effective temperature for orthogonal polarization and measure the soils' range of radiance temperatures at various external conditions at 1.4-1.8 mm wavelengths. It is noted that in determining the thermodynamic surface temperature from the measured effective temperature by the above method for orthogonal polarization, the surface roughness parameters and atmospheric conditions must be taken into account; otherwise, an error on the order of 10% may be expected within a 2.2-8.6 mm band which corresponds to a 30K error. Figures 5; tables 1; references 7: 6 Russian, 1 Western.

Electromagnetic Wave Field Scattering by Solid Cylinder With Sectorial Cut

[Article by Ye.V. Shepilko; UDC 537.877.01]

[Abstract] The numerous inhomogeneities which characterize real complex obstacles and distinguish them from circular cylinders and make it difficult to simulate them by a circular cylinder irradiated with an electromagnetic wave, i.e., a longitudinal recess or a sectorial cut, necessitated an analysis of the backscattering cross section on the

basis of a strict solution of the problem of electromagnetic wave field scattering by a circular infinitely long cylinder with a sectorial cut and by a sectorial cylinder which may be used for simulating a bilocal polygon; it is assumed that the cylinder is a perfect conductor with an exp(-*it*) behavior. The problem is solved in a ρ, φ, z cylindrical system of coordinates; the dependence of the sectorial cylinder's backscattering coefficient on the relative diameter and angular cut dimension for E and H-polarization is plotted. The findings are compared to a plane tape and circular cylinder, and it is shown that the effect of the cut depends on the wave polarization; this is manifested by the oscillating behavior of backscattering. The author is grateful to V.P. Shestopalov and B.Z. Katsenelenbaum for constructive remarks and discussions. Figures 2; references 7.

Image Contouring of the Volumetric Opaque Edge in a Coherent Light

947K0032X Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 45-53

[Article by V. A. Sokolov, Yu. V. Chuguy; UDC 535.42:535.31:53.082.5]

[Abstract] Results of studies of the features of forming the outlines of three-dimensional edges of images are offered here for a general case, when the amplitude of the light reflection coefficient from its internal surface has a value between 0 and 1. This image is referred to as "gray" or (opaque). The intensity profile of the image front edge outline of the gray extended side at different reflection coefficients r(0;0.3;07 and 1.0) is shown in graphs for different N: N=2; N=1; N=05; N=)1, where N is the number of the Fresnel zone. Features of forming the outline of the rear edge of the extended side were also examined, demonstrating that in case of insignificant volumetric effects, the image resembles the contour of a plane edge. However, the coordinates of the fundamental minimum do not coincide with the geometric position of the object's boundary. With significant volumetric effects, the reflecting properties of the internal edge have a substantial influence on the structure of the outlined image. Figures 6, references 11: 7 Russian, 4 Western.

Interference Errors in Photometry by a Gaussian Beam

947K0032AA Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 78-82

[Article by V. S. Pondarev; UDC 620.179:621373]

[Abstract] Interference methods and results of computing interference contrast and the corresponding errors in light reading in the case of a scalar wave field, depending on the characteristic of the entirely coherent low-order Gaussian beam are discussed in this article. It is assumed that the Fresnel coefficients are invariant and that the reflection from an inclined angle of incidence on the edge of the sample produces no phase shifting. Results of numerical computations for semi-conductor plates are provided. It is demonstrated that the interference intensity ir the examined case is determined by a particular thickness of the plate and its effective coefficient of reflection. Curves of the interference contrast as a function of the sample

thickness for different values of the effective reflection coefficient, and the relationship between the maximum relative light reading error and light transmissions by the plate were obtained. Figures 3, references 9 Russian.

The Physical Concepts of a Practical Interferometry

947K0032Z Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 59-77

[Article by L. A. Borynyak, A. V. Loginov, P. M. Mednis, S. N. Sarnadskiy; UDC 621.378:682.33]

[Abstract] Interference-optical methods for information processing dealing with space-time parameters of several physical phenomena are examined. The information is in the form of a universal optical signal - interference pattern. In addition to examining the traditional methods of processing the interference pattern, methods, based on supplementary modulation in time and space, are also examined along with methods of spatial frequency measurements. Some new phase measuring methods are proposed and areas of their practical application are pointed out. An example of a digital analysis of interference pattern, which has a practical significance, is provided. Figures 5, references 64: 21 Russian, 43 Western.

Diffraction by Complex Synthesized Gratings-Interference Pattern

947K0032Y Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 54-59

[Article by V. Yu. Osipov; UDC 535.8:535.514:535.317.61]

[Abstract] Experimental realization of a laser beam diffraction on micro-transparancies of synthesized interference pattern with a 1.5 mm diameter indicates that in the Frauenhofer diffraction region, the wave field has a pseudo-caustic character exhibiting a characteristic flare and cell structure. This constitutes an experimental proof of the fact, that for the focusing systems with a meridional aberration of the third order coma, the caustic diffraction fields, produced in the focal plane, and complex interference fields, formed in the Twyman-Green interferometer and describing the deviation of the converging wave front from the reference sphere, are qualitatively related by the Fourier transform. Figures 4, references 13: 7 Russian, 6 Western.

Optical-Electronic Neural Network Based on a Holographic Photo-Thermoplastic Disk

947K0032W Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 37-44

[Article by A. A. Akayev, A. A. Kutanov, S. Z. Dordoyev, B. D. Abrisayev, I. A. Snimshchikov; UDC 681.51:681.3]

[Abstract] Fundamental characteristics of optical electronic neural network on a holographic photo-thermoplastic disk are examined. Based on the method of simultaneous local hologram recording on a photo-thermoplastic (PTP) disk with infra-red laser heating, and a method of automatic recording of two- dimensional Fourier holograms with uniform characteristics over the entire PTP surface and control of the recording process by a personal computer, a PTP disk with a holographic recording was developed. A picture of the PTP disk is

shown, and the optical vector-matrix multiplication process is described. Information recording density of 2×10^5bit/mm^2 was experimentally obtained by this method. It can provide a 1 Gbit capacity of the holographic PTP disk with a 133 mm diameter. Diffraction effectiveness, obtained for Fourier hologram digital information with a diameter of 1 mm, was 5% while signal-to-noise ratio was not smaller than 70:1. Prospects of developing an optical-electronic neural network (OENN) using a holographic disk (HD) in systems for optical information processing appear to be the most attractive. The accuracy and speed of signal processing with the OENN-HD system is analyzed. Comparison between the best electronic neural computers indicates that the OENN-HD parameters are not inferior to the parameters of the multiprocessor computing system "Connection Machine-2" Figures 5, tables 1, references 18: 10 Russian, 8 Western.

Optical Amplification in the Photopolymer Material

[Article by A. V. Konstantinova, Ye. F. Pen, A. M. Sinyukov, V. V. Shelkovnikov; UDC 535.417:773.93]

[Abstract] Results are described in this article of studies dealing with the optical amplification in amorphous photopolymer materials GFPM 633 which exhibit a high sensitivity in the red spectral region. The material is designed for recording phase holograms by the He-Ne laser radiation ($\lambda=632.8$ nm). The experiments on optical amplification were made with a holographic apparatus using a series produced LG-52-1 laser. The dynamics of diffraction efficiency at $\lambda=760$ nm for recording with optical amplification on photopolymer material GFPM-633-2 is shown in a graph. For this type of material, the gain was in the 2-60 range. Holographic characteristics were also obtained for this material. The relationships of the initial, final and corrected diffraction efficiency as a function of the initial time of exposure for the 632.8 nm wavelength are also provided. The gain corresponding to the diffraction efficiency curves is also shown in the graphs. The mechanism of optical amplification in the photopolymer material is discussed. Figures 6, references 16: 10 Russian, 6 Western.

Low-Temperature Annealing and Physical Properties of the Photosensitive PbS Films

[Article by O. A. Gudayev, V. A. Treshchikhin; UDC 621.315.592]

[Abstract]The effects were examined of low temperature annealing ($T<100°$)of chemically deposited PbS layers in an oxygen containing medium and in a vacuum, on the spectrum and value of photosensitivity, dark resistance, noise, etc. It was demonstrated that there exist a simultaneous close correlation between dark conduction of samples and their photoconduction. This correlation is explained by the charge transfer mechanism in media with strong spacial fluctuations of conduction. In view of the fact that despite strong changes in the photosensitivity

value no significant changes occurred in the photoconduction spectrum during the process of low temperature annealing, it may be concluded that the absorption coefficient is not changing. Changes occur in the product of the parameters $\mu\tau$, where μ is the conduction and τ is the life-time of the nonequilibrium carriers. In order to uncover which is the most contributing factor in the photoconduction changes: changes in the transport properties of the carriers, which affect the dark conduction, or changes in the life-time of nonequilibrium carriers, the dark conduction of samples and their photoconduction, as well as the photoconduction and the life-time of the nonequilibrium carriers was examined. These parameters were measured in a lot of samples with a large distribution of the photoconduction value. Samples with a higher conduction exhibited a higher photoconduction. Figures 4, references 6 Russian.

Holographic Characteristics During Recording of Volume Phase Holograms in a Photopolymer Material

[Article by T. N. Gerasimova, A. V. Konstantinova, Ye. F. Pen, A. M. Sinyukov, V. V. Shelkovnikov; UDC 535.417:773.93]

[Abstract] Organic lightsensitive material GFPM-633, designed for recording phase holograms in a real time mode by He- Ne laser radiation ($\lambda=632.8$nm) with diffraction efficiency upto 90% has been developed. Results are provided on reconstruction experience of phase holograms using this material. It is pointed out that it has a 20mJ/cm^2 sensitivity, for 50% diffraction efficiency and the features of the recording mechanism are examined. It is determined that the material does not provide a high diffraction efficiency of the recorded holograms for a long time. The feasibility is demonstrated of recording on this material Fourier holograms of test images with a diffraction efficiency 9-15% and 50:1 average contrast of the image and also with 10 superimposed holograms. One possible application area of the examined photopolymer materials (PPM) lies in producing phase copies of amplitude templets of synthesized holographic elements. Experience of working with the PPM demonstrated the feasibility of efficient application of theses materials for model experiments on holographic interferometry and for optical information processing. Figures 6, references 14: 7 Russian, 7 Western.

The Effect of Surface Recombination on the Parameters of PbS Film Photodetectors

[Article by O. A. Gudayev, E. E. Paul; UDC 621.315.592]

[Abstract] Experiments performed with PbS samples for finding the parameters which determine the motion parameters and recombination of the carriers, as well as the value of the PbS photosensitive layers as a function of temperature, demonstrated that the behavior of the photoconductivity temperature curves in the low temperature region is determined by the mobility temperature of the

charge carriers, and in the high temperature region is determined by exponential dependence on the life-time temperature of nonequilibrium carriers. Depending on the technology of the substrate preparation before the photosensitive layers are deposited, the surface condition at the interface between the film and the substrate can play a role in the recombination process If the surface recombination is increased, the life-time of the nonequilibrium carriers and the mobility is decreased, and the temperature dependence of the photoconductivity is changed. Figures 4, references 6: 5 Russian, 1 Western.

Planar Holographic Splitters for Formation of 3-D Interconnections

947K0032G Novosibirsk AVTOMETRIYA in Russian No. 3, May-June 93 pp 64-67

[Article by M.V. Basanov, Ye. F. Pen, P. Ye. Tverdokhleb; UDC 535.232.65]

[Abstract] Light beam splitters for formation of three-dimensional interconnection, employing planar light-guides based on the effect of total internal reflection, and holographic arrays for the radiation input and output are examined in this paper. Single-beam arrays for input and output, as well as multiple-beam arrays are discussed and their characteristics are compared. It is demonstrated that in such microcircuits the application of multiple-beam arrays for radiation output is preferable, because when the light losses in the hologram materials are taken into account, they provide a significantly greater efficiency of utilizing the light source power than the single-beam arrays. When the coefficient of light attenuation is 3dB/cm, splitters with a N=1024 output beams and a laser power efficiency of 50% can be produced using the multiple beam arrays. Figures 3, tables 2, references 6: 1 Russian, 5 Western.

Mechanisms of Photo-Induced Polarized-Anisotropic Scattering in LiNbO$_3$

947K0032Q Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 3-13

[Article by I. F. Kanayev, V. K. Malinovskiy; UDC 535.215.12:537.226.33]

[Abstract] Polarization-anisotropic (PA) light scattering, i.e. scattering with polarization rotation exhibited in the ferroelectric crystals is examined. The dynamic model of the PO scattering is qualitatively substantiated and the physical model of this phenomenon in the LiNbO$_3$ is clarified. Data are provided demonstrating a significant difference in the development of the polarization anisotropic (PA) and polarization isotropic (PI) time characteristics. For the PA-scattering, a long lasting time delay of the beginning of development and longer times (by the factor of 5-10) of reaching the equilibrium state are typical. In the proposed model, the PA scattering is related to the noise of the fluctuating fields, perpendicular to the Z axis, which are induced by the photo-galvanic current flowing parallel to the Z axis. Light, scattered by the noise field, undergoes a non-steady state holographic amplification. The holograms are recorded due to interaction between the beams of PA and PI-scattering and the fundamental beam. It was demonstrated that in the case of PA-scattering, the

holographic gratings can also act as the scattering centers. The latter are recorded by the beams of the PA-scattering, while the Braggs conditions are fulfilled only for the fundamental beam. The experimental data indicate that hologram recording in the LiNbO$_3$ can occur only due to the scalar interference. Reasons causing the scattering of the regular wave into an irregular wave and vice versa are discussed. Figures 6, references 7 Russian.

Photoelectric Linkage in Photodetector Matrices based on Silicon and A^{III}B^V compounds

947K0032P Novosibirsk AVTOMETRIYA in Russian No. 3, May-June 93 pp 117-120

[Article by S. A. Malyshev, S. Yu. Rakhley; UDC 621.383.52]

[Abstract] The photo-electric linkages between the matrix elements of photodetectors made with GaAs and InP, which are the most common of the A^{III}B^V compounds. For determination of the coefficient of photoelectric linkage K_c, current I_Φ was measured by illuminating the examined photodetector matrix. Next, the photodetector was covered by a light-tight screen and its current value was measured when the adjoining photodetector was illuminated. The value of K_c was determined from equation $K_c = I_c/I_\Phi$. Spectral measurements were performed with a diffraction monochromator MDR-23. The results of this study indicate that the diffusion length of the minor charge carriers is the parameter of the material, which significantly affects the value of K_c. It was demonstrated that in the high sensitivity spectral region, the curve of K_c as a function of the substrate thickness has a maximum, whose value depends on the relationship between the absorption depth and the radiation wavelength. It was established that the spectral characteristic of the coefficient K_c of the GaAs and InP photo matrices is shifted to the shortwave spectral region, compared to silicon. Figures 5, references 9: 2 Russian, 7 Western.

Parallel Photo-Matrix LSI Circuit with a Logic Processing of Data Pages

947K0032N Novosibirsk AVTOMETRIYA in Russian No. 3, May-June 93 pp 106-113

[Article by V. N. Pankov; UDC 681.31:535]

[Abstract] A new approach is examined for designing parallel specialized photo-matrix LSIC, employing metal-dielectric- semiconductor (MDS) technology, capable of not only reception, photoelectric conversion and storage of logic signals, but their parallel logic-arithmetic processing as well. The results are reported of a new photo-matrix LSIC PMAMD (Photo-Matrix Associative Memory Device) for realization of parallel data search methods from optical memory organized by pages. High speeds of photoelectric transformation of the data of optical pages and their parallel processing is successfully combined in this LSIC with a high reliability and interference rejection of photoelectric transformation during the data flow, divergence of optical parameters of the page images, nonuniformity of the light background, electrophysical parameters of the photoelectronic LSIC crystals, and also

nonuniformities produced by technology of the LSIC manufacturing. The structural diagram of the proposed photoelectronic LSIC PMAMD is provided. Testing of experimental samples of the PMAMD demonstrated that with the optical signal power 5×10^{-8} W/Bit, the photo-sensitivity of the PMAMD elementary cells (not less than 10^{-13}, can produce a 100 Mbit/s rate of the data flow at the optical input to the PMAMD. Figures 5, references 20: 17 Russian, 3 Western.

Modeling, Design and Application of Opto-electronic Devices

[Article by K. K. Ziling, A. Ye. Kolosovskaya; UDC 621.372.8]

[Abstract] A solution was obtained for the problem of electro-optic interaction of the fundamental mode of a channel waveguide with the field produced by electrodes. Generalized variables were used for the solution. Computations were made for one of the most promising class of integrated optical devices - modulators on ferro-electric $LiNbO_3$ type crystals, where the wave structure is formed by diffusion of additives from the applied thin film. Based on the analysis of the solution, the combination was found of the waveguide - electrode system parameters, which provide the least possible half-wave voltages U_π. It was established that the factor theoretically limiting from below the U_π values in the red and infrared spectrum region is the maximum value of the increment of the refraction index attainable in a diffusion waveguide. The relationship of the minimal U_π as a function of λ was constructed for the $Ti:LiNbO_3$ waveguides. Introduction of a buffer layer does not change qualitatively the results of the analysis. Figures 8, table 1, references 19: 7 Russian, 12 Western.

Diffraction Demultiplexers for Three-Dimensional Integrated- Optical Circuits

[Article by N. N. Kamenev, V. I. Nalivayko; UDC 621.372.8:535]

[Abstract] A feasibility is demonstrated for developing a converter of a monochromatic light beam into a line of parallel light beams of identical intensity. A three-dimensional divider of the monochromatic radiation was examined here. This divider can be useful for the development of three-dimensional integrated-optical circuits. The proposed device includes a waveguide, and input and output diffraction gratings. Planar waveguides, obtained by diffusion of silver ions into an oxide glass substrate, were used. The input and output elements of the demultiplier consist of a thin relief type diffraction grating. The elements were prepared by projecting the interference pattern produced by crossed beams of argon laser, on the 0.4 - 0.6μm thick As_2S_3 films, sputtered by a thermal evaporation in a vacuum. After exposure, the diffraction efficiency (DE) increased during the transformation process of the grating structure. For an effective performance of the device, the input grating must have a maximum possible value of the

DE. In the experiments performed here, the DE was on the order of 50%. Figures 2, references 8: 5 Russian, 3 Western.

Features of 3-D Optical Recording of Binary Information

[Article by I. Sh. Shteynberg, Yu. A. Shchepetkin; UDC 681.327.68:621.373.826]

[Abstract] Some features of recording medium behavior in multi-layer recording devices are examined. At the present time, halogen-silver photo-emulsion is the only material exhibiting a 10^{-4} - 10^{-5} J/cm² sensitivity with nanosecond exposure, and a dynamic range of $\Delta n = 0.1$. With a 50-100μm thickness of emulsion, information can be recorded in 5-10 layers. However, the processing of materials with this thickness is difficult. Photopolymer is a convenient material for immediate reading after recording. The significant advantage of the photopolymers is the fact that there is no need for a "wet" processing, a self fixation with recording, and a substantial light amplification. However, because the power density in the recording region is much greater than the optimal, the sensitivity is decreased with recording. The other feature is the dependance of the medium absorption coefficient on exposure. Some characteristics of several recording media, significant for application with multilayer recording devices, are listed in a table. One of possible options for reaching a compromise between the layer sensitivity and the total number of layers is the application of a two-photon absorption. A possible recording diagram of a two-photon recording is described. With application of a two-photon absorption the fundamental problems of the multi- layer recording can be solved. This includes a uniform recording in a bulk and a nondestructive reading at the recording wavelength. However, the two-photon absorption coefficient for most media is small, and becomes significant only with a power density of 10^7 - 10^8 W/cm². Figures Figures 4, tables 2, references 9: 5 Russian, 4 Western.

The Structure and Circuit of the Cell of an Optical Transparency Based on Thin Ferroelectric Films

[Article by B. N. Pankov; UDC 537.228:621.3.049.77]

[Abstract] Problems of organizing and selecting the structure and circuit of elementary cells of a controlled transparency of an opto-electronic memory device based on thin ferro-electric films are examined. The feasibility and advantages are demonstrated of combining the complimentary metal oxide semiconductor, silicon on sapphire or silicon on insulated substrate with the technology of thin ferroelectric films. A structural diagram of a transparency cell with electronic recording of information is provided and its functioning is discussed. The cell contains an electronic memory element - a static flip-flop - and four identical light modulators. Two of these modulators are switchable and have a paraphase control. Two other, reference modulators, are not switchable and are controlled by a dc voltage from an external source. An other cell is also described, which contains a differential converter with two photo-receivers at

the input. For a group parallel optical information recording on the transparency, it is best to employ in the cell a differential photo-electric converter with two photo-detectors at the output operating in the optical signal integration mode and a latch flip-flop at the output. Figures 4, references 13: 8 Russian, 5 Western.

Geometrical Aberrations of a Quasi-Planar Lightguide

947K0032FF Novosibirsk AVTOMETRIYA in Russian No. 4, Jul-Aug 93 pp 102-106

[Article by S. V. Mikhlyayev; UDC 535.317:681.7.012]

[Abstract] Geometric aberrations of a lightguide because of a nonparallel orientation of its walls have been examined. The lightguide consists of a transparent medium bound by two planes. The lower plane coincides with the XY plane, the Z axis is directed normal to this surface. The upper plane is oriented at an angle to the lower, so that it intersects planes ZY and ZX at angles α and γ. The incident light beam lies in a plane x=constant, and forms an angle β with the normal to the lower plane. If the walls are not parallel, when α and β are not equal to zero, geometric aberrations are produced, which are deviations Δx_i, Δy_i of the coordinates of the beam intersection points with the lower plane from their value, compared to the ideal case. Computations of Δx, [Dy] as a function of the number of reflections N for different values of parameters α and γ were made and the results are shown in the graphs. Cases of the light beam propagation through a quasi-plane light guide and a case of the coordinates deviations Δx, Δy from N because of the light beam divergence were also examined and the results are provided. Figures 11, references 6: 1 Russian, 5 Western.

Considering the Effect of Sea Bottom Relief on On-Board Gravimetric Measurements Based on the Collection Method

[Article by I. A. Zhuravlev, Dnepropetrovsk Mining Institute, Dnepropetrovsk, Ukraine; UDC 550.831]

[Abstract] This article describes an algorithm to calculate corrections for sea bottom relief. The main problems to be solved in developing this type of algorithm are automating the construction of a digital model of the sea bottom, and simplifying and speeding up calculations of the effects of elementary bodies (approximated by a layer of water). The article presents a new approach to solving these problems. Points at which the depth of the sea is known are arranged in an irregular grid, and depths are calculated in a regular grid within that portion of the survey area. Two interpolation methods are described. The collection method is described. It is used to calculate the gravitational effect of rock beneath the sea. The algorithm has been implemented in the software of an automated system to process on-board gravimagnetic measurements. Product testing is described Results of its use are presented. The algorithm is used to study Bouguer anomalies. Figures 2; references 6 (Russian).

Flying Laboratory for Ecological Monitoring

[Article by A. I. Furman, Aerokos Asoication, Ukraine; UDC 551.507.352:504.064.36]

[Abstract] An L-410 UVP-E aircraft has been refitted to be a flying laboratory for ecological monitoring. This aircraft differs from an L-410 in its increased payload capacity, increased flight duration, and increased altitude ceiling. Five-blade propellers make it more efficient and quieter. It can fly at low altitudes (70-300 m) and up to 5000 m at a relatively low flight speed (210-350 km/hr). Additional fuel tanks enable five hours of flight without refueling. This aircraft costs a factor of 4-5 less to operate than an An-30. It is equipped with instruments for gamma ray studies (using scintillation detectors), thermal sensing, and spectral analysis (to study chemical pollution). In-flight processing is possible with the use of personal computers. The aircraft has been used to compile computer maps of the gamma ray background of a 30 km zone around the Chernobyl and Zaporozh atomic energy plants. Thermal radiation studies have been done using real-time infrared surveying. Figures 2

Greenhouse Heating of the Earth's Climatic System

[Article by N. A. Bagrov, Hydrometeorological Scientific Research Center; UDC 551.513.001.572:551.583]

[Abstract] Linearization of the heat balance equation for the climatic system leads to the linear differential equation for the dependence of system temperature on CO_2, the main substance absorbing longwave radiation. Estimates of equation parameters make it possible to find simple connections between temperature and CO_2 content in the atmosphere. Attempts are made to predict the heat pattern for the next few decades. References 10 (Russian).

Study of the Forms of Existence of Pollutants in the Marine Environment (using the example of the Gulf of Tagarog on the Azov Sea)

[Article by S. G. Oradovskiy, A. N. Zubakina, I. M. Kuznetsova, I. S. Matveyev, V. V. Georgiyevskiy, Ye. S Lebedeva, State Oceanographic Institute; UDC 55.464.38(262.54)]

[Abstract] Based on expeditions to the Gulf of Taganrog in 1989 and 1992, the distribution of the most common pollutants in this region are analyzed (petroleum products, chlor-, nitro-, and alkyl phenols, anionic, cationic, and nonionogenic surfactants, sym-triazine pesticides, and heavy metals). Sea water, pollutants in suspension, and bottom sediments were studied. Phenols, methyl thiotriazines, cadmium, and copper are mostly in solution, while nickel, chlortriazine, and cationic surfactants are in suspension. Petroleum hydrocarbons, lead, and anionic and nonionogenic surfactants are found in the sea in these forms in comparable quantities. Estimates are given of contamination of bottom sediments with these substances. Herbicides are concentrated in the surface layer. Surface layer concentrations vary widely. Figures 3; tables 3; references 4: 2 Russian, 2 Western.

M_2 Tidal Wave in the Arctic Ocean. 1. Structure of the Barotropic Tide

[Article by I. V. Polyakov, N. Ye. Dmitriyev, Arctic and Antarctic Scientific Research Institute; UDC 551.466.7.001.572(268)]

[Abstract] This is the first of two articles. Mathematical modeling with a three-dimensional nonstationary baroclinic model with a free surface is used to reproduce the three-dimensional structure of the M_2 tidal wave in he barotropic Arctic Ocean. The second article describes the results of numerical experiments studying the M_2 tidal wave in a stratified Arctic Ocean. Here, it is found that the oscillations of the level correspond to generally held ideas about the tidal wave dynamics of the Arctic Ocean level. The main mechanism responsible for the structure of the field of the M_2 level in the Arctic Ocean is resonant adjustment of level oscillations to morphometric features of the basin. Deep ocean is characterized by weak, vertically homogeneous currents. Vertical motions in the upper layers of the ocean depend on the dynamics of the free surface. As depth increases, the bottom relief becomes decisive for the vertical component of the tidal wave current. A nonperiodic component is found in the barotropic tidal wave current. The effect of the boundary between a continental shelf and deep ocean on currents is outlined. Figures 7; references 22: 6 Russian, 16 Western.

Evolution of a Launch Cloud After the Launch of a Solid Fuel Rocket

[Article by A. S. Kabanov, Tayfun Scientific Production Association; UDC 551.576.11:551.510.42/522.629.782]

[Abstract] Changes over time to the horizontal size of a water vapor and hydrochloric acid launch cloud ater the launch of a solid fuel rocket are calculated. Its lifetime at the surface is calculated for various meteorological conditions. Calculations were done for clouds which formed after space shuttle launches. The time for the cloud to be destroyed by precipitation is estimated. The following assumptions are made: the troposphere is not saturated with moisture; there is no cloud cover; the temperature and concentration of water vapor does not change over the cloud's lifetime; wind speed in constant. Cloud altitutde is assumed to be limited by an inversion layer. The vertical and horizontal components of turbulent diffusion are described. Figure 1; references 10: 4 Russian, 6 Western.

BIOTECHNOLOGY

New Site-Specific Endonuclease and Methylase From *Bacillus licheniformis* 736

[Article by N.N. Matviyenko, V.M. Kramarov, L.A. Zheleznaya, and N.I. Matviyenko, Molecular Diagnosis and Treatment Institute, Moscow, Theoretical and Experimental Biophysics Institute, Russian Academy of Sciences, Pushchino, and Protein Institute, Russian Academy of Sciences, Pushchino; UDC 577.152.314'1]

[Abstract] The new site-specific endonuclease R *Bli*7361 and methylase M *Bli*7361 have been isolated from *Bacillus licheniformis* strain 736 by blue-agarose, hydroxyapatite-Ultragel, and heparin-Sepharose chromatography. The new enzymes were found to be free of interfering impurities. The endonuclease R *Bli*7361 recognizes the DNA sequence 5'-GGTCTCN1-3'[downward arrow-pointing] and 3'-CCAGAG5N-5'[upward-pointing arrow] and cleaves it, as indicated by the arrows, at a distance of 1 and 5 nucleotides from the recognized sequence to form single-strand 4-nucleotide 5'-protruding termini. This new endonuclease is thus an isoschizomer of *Eco*31I, *Ppa*I, and *Bsa*I. The isolation of M*Bli*7361 was hailed as opening the possibility of studying the nature of the methylation of the enzyme site recognized by it. Several possible applications of the new enzymes were discussed: (1) using R *Bli*7361 with the DNA of the plasmid pBR322, which has only one site for this restrictase that is located in the gene of resistance to ampicillin, in order to cleave the molecule and thus permit radioactive labeling that would in turn facilitate more precise restriction mapping (by Smith and Bernstiel's method) of DNA fragments integrated at the *Pst*I site; (2) using *Bli*7361 with the DNA of the phage λ for selective labeling of terminals by using a Klenow fragment as an alternative to using labeled oligonucleotides complementary to the natural "adhesive" terminals of the DNA of the phage λ in "cos"-mapping of recombinant phages; (3) using *Bli*7361 to create selective "holders" for site-specific mutagenesis or to create vectors for directed unilateral shortening of integrated fragments and to create "restoring" and "multiplication" vectors. The promise of using the new restrictase to create "restoring" vectors was given special attention. Specifically, it was stated that because the phage M13mp18 does not contain sites for *Bli*7361, taking two oppositely directed sites for *Bli*7361 that have a GC-dinucleotide between them and introducing them into a polylinker sequence will result in the creation of a site for the "blunt-ended" restrictase *Nru*I, for which there is no site in the vector either. This *Nru*I site may then be used to clone chemically synthesized oligonucleotides for the purpose of subsequently assembling a whole gene in a single ligation reaction from oligonucleotides cut from recombinant DNA by using *Bli*7361. Figures 16; references 15: 2 Russian, 13 Western.

Reaction of Perfluoroctylbromide With Hepatic Microsomal Monoxygenase

[Article by V.V. Obraztsov, A.Yu. Grishanova, D.G. Shekhtman, A.N. Sklifas, and K.N. Makarov, Cellular Biophysics Institute, Russian Academy of Sciences, Pushchino, Moscow Oblast, Clinical and Experimental Medicine Institute, Siberian Department, Russian Academy of Medical Sciences, Novosibirsk, and Elementoorganic Compounds Institute, Russian Academy of Sciences, Moscow; UDC 557.152.1]

[Abstract] The recent development of blood substitutes based on fluorocarbons has led to the creation of "second-generation" fluorocarbons that satisfy biomedical requirements more adequately. Specifically, an emulsion of perfluoroctylbromide [PFOB] emulsion that was initially proposed as an x-ray contract medium is now being considered as the basis of a promising universal blood substitute. PFOB was incorporated as a component in a gas-transport emulsion and injected intraperitoneally into female Wistar rats (weighing 180-220 g each) in a dose of 10 ml/kg for 3 days. Phenobarbital was analogously injected in a dose of 80 mg/kg. The microsomes of the murine livers were isolated by differential centrifugation, and the content of total cytochrome P-450 in the microsomes was measured based on their CO spectra. When the fluorocarbon emulsion was added to the microsomal membranes, an enzyme-substrate complex, i.e., fully fluorinated organic compound-cytochrome P-450, was observed to form. The spectral characteristics of the PFOB-cytochrome P-450 complex were similar to that of the complex perfluorodecalin-cytochrome P-450. Injection of the PFOB emulsion into the rats resulted in a 20 percent decrease in the amount of cytochrome P-450 in their hepatic microsomes. An analysis of the kinetics of the formation of Br when reduced nicotinamide adenine dinucleotide phosphate [NADPH] is added to the murine microsomes in the presence of a PFOB emulsion established that the concentration of free Br in the study specimens is 1-2 μM higher than in control specimens. These findings were taken as unequivocal confirmation of the possibility of NADPH-dependent liberation of Br from PFOB in the presence of microsomal membranes. The experiments on induction of microsomal monoxygenase were interpreted as confirmation of the fact that PFOB is a much weaker inducer of the "phenobarbital" isoforms of cytochrome P-450 II B_1/B_2 than the classic fluorocarbon inducer of cytochrome P-450 (i.e., perfluorodecalin) is. It was hypothesized that the anomalous cytochrome P-450-inducing properties of PFOB may be linked to its ability to be metabolized by hepatic microsomal monoxygenase. For this reason it was concluded that the generally accepted opinion regarding the inertness and invariance in the body of organoperfluoro compounds containing both heteroatoms (N, O, H, etc.) and double bonds needs additional verification. This study was said to be the first successful demonstration of the fact that enzyme systems of a living organism are capable of causing the destruction of fully fluorinated organic compounds. Figures 3, tables 2; references 16: 5 Russian, 11 Western.

Reaction of Oligonucleotides With Blood Serum Proteins

[Article by V.V. Vlasov, L.V. Pautova, Ye.Yu. Rykova, and L.A. Yakubov, Novosibirsk Institute of Bioorganic Chemistry, Siberian Department, Russian Academy of Sciences; UDC 577.123]

[Abstract] A study examined the reaction of oligonucleotides and their reactive derivatives carrying the fragment 4'[N-2-chloroethyl-N-methyl)amino]benzylamine in their 5'-terminal phosphate group with the proteins of blood serum. The desoxyribonucleotides $p(T)_{16}$ and (pTGACCCTCTTCCCATT) used in the studies were synthesized by the phosphotriester method in a solution. A ^{32}P radioactive label was introduced into the oligonucleotides by exchange of the 5'-terminal phosphate. Double-stranded DNA of the plasmid pTZ18R and heparin were used as competitors to determine the specificity of the reaction of the oligonucleotide derivatives with the proteins. Murine monoclonal antibodies specific for human myoglobin were used to study the interaction of the oligonucleotides with the immunoglobins IgG and IgM. During the experiments, whole human blood serum was incubated with different concentrations of alkylating oligonucleotide derivatives at 37° for 10 or 40 minutes. The modified proteins were analyzed by DS-Na-electrophoresis in gradient polyacrylamide gel in a Laemmli system. The experiments demonstrated that incubation of whole human blood serum with different concentrations of the alkylating derivative $p(T)_{16}$ results in affine modification of several proteins, including albumin and the immunoglobins M and G. The dependence of the degree of modification of these three proteins on oligonucleotide concentration was taken as evidence that the oligonucleotides have a higher affinity to IgM than to IgG and albumin. Binding of the reactive oligomer derivatives with the proteins was inhibited in the presence of various polyanions, i.e., oligomers of another composition, double-strand DNA, and heparin. The fact that heparin had the greatest inhibiting effect for the immunoglobins led to speculation regarding relatively nonspecific ionic interaction in the formation of the complex IgG-oligonucleotide. Reaction of the oligonucleotide with monoclonal antibodies of the subclass G1 was inhibited in the presence of a specific antigen. This finding was taken as an indication that the oligonucleotides may react with the immunoglobins either at or near the site where the antigen is recognized by the antibody. The experiments performed thus established that oligonucleotides bind with basic blood proteins with a rather high affinity and revealed interacting features of the reaction of immunoglobins with oligonucleotides that may be used to study the effector functions of these molecules. Figures 4; references 9: 3 Russian, 6 Western.

Isolation and Characteristics of α-Specific Thrombin-Like Enzymes From the Venom of the Common Pit Viper (*Agistrodon halys halys*) and the Eastern Pit Viper (the Central Asian Subspecies *Agkistrodon halys Blomhoffii*)

[Article by D.A. Solovyev and T.P. Ugarova, Biochemistry Institute imeni A.V. Palladin, Ukraine Academy of Sciences, Kiev; UDC 577.152.34]

[Abstract] The method of affine chromatography on agarose with the immobilized dye blue cybacron F3GA (Blue-Sepharose 6B CL) was used to isolate two thrombin-like enzymes from the venom of common and eastern pit vipers (*Agistrodon halys halys*) and *Agkistrodon halys Blomhoffii*). The new enzymes, which were given the respective names Ancistron-H and Ancistron-B were isolated in homogeneous form. The new thrombim-like enzymes are serine proteases with respective molecular masses of 34 and 29 kDa, respective isoelectric points of 6.6 and 6.3, and respective specific coagulation activities of 410 and 110 NIH units/mg of protein. Upon incubation with fibrinogen, they only cleave fibrinopeptide A from the Aα-chain, leaving the BB- and γ-chains intact. Both enzymes were demonstrated to hydrolyze arginine esters and thrombin-specific chromogenic peptide substrates and to manifest weak caseinolytic activity and no fibrinolytic activity. The newly isolated enzymes were used to develop simple coagulation-based diagnostic indicators to determine the fibrinogen level in blood plasma during heparin therapy without the need for any special equipment. Ancistron-H may also be used for clinical purposes. Tests conducted on rabbits confirmed the possibility of using it in vivo as a defibrination agent. Specifically, intravenous [IV] injection of Ancistron-H in a dose of 300 NIH units per kilogram of body weight resulted in the death of all of the test animals within 2-5 minutes as a result of the development of acute thrombosis of the truncal vessels and in the vicinity of the right ventricle. After IV injection of Ancistron-H in a dose of 100 NIH units per kilogram of body weight, all the test animals remained alive; however, blood taken from them 30 minutes later showed advanced hypercoagulation. Blood samples taken 120 minutes after the animals were given IV injections of Ancistron-H in a dose of 25 NIH units per kilogram of body weight, on the other hand, confirmed the development of deep hypofibrinogenemia. The possibility of using Ancistron-H for analogous purposes was also confirmed in experiments studying the effect of a decrease in fibrinogen level on metastasized L carcinoma in mice. IV injection of Ancistron-H into the mice's venous sinus in a dose of 2.5 NIH units per kilogram of body weight induced a decrease in fibrinogen level to 30 percent of the norm, which in turn reduced metastasis by a factor of 2.7-3. Experiments on mice also confirmed the possibility of using Ancistron-H to prolong the effect of liposomal drugs during correction of the process of intravascular blood coagulation. Figures 3, tables 3; references 42: 12 Russian, 30 Western.

Gas Scrubbing Facilities

[Article by V.F. Fursenko and I.M. Kaplunova, candidates
of technical sciences, and N.N. Zhukova, engineer, Rostov
Institute of Railroad Transport Engineers]

[Abstract] For a long time, the only equipment designed in
Russia to scrub gases released into the atmosphere by
industrial and power generation facilities was ash- and
dust-trapping equipment. Most of the pieces of gas- and
dust-trapping equipment that were designed had compar-
atively low trapping coefficients. It has been estimated that
hundreds of billions of rubles in "emergency capital expen-
ditures" are needed to achieve current maximum permis-
sible one-time concentrations of various toxic substances
(including sulfurous anhydride and nitrogen dioxide) in
cities throughout Russia. Two indicators of maximum
permissible concentration of toxic substances are currently
in use. The maximum permissible one-time concentration
is determined by air sampled over a 20-minute period at
the level of the respiratory organs, and it refers to effects on
the threshold of reflex activity (sense of smell, light-
headedness, bioelectric activity of the cerebral cortex). The
maximum permissible average daily concentration, on the
other hand, refers to a 24-hour sampling at the same level
in a given area in which an animal could go 3 or 4 months
without experiencing any observable toxic or other related
effects on its body. The maximum permissible one-time
concentration is thus an indicator of human comfort,
whereas the maximum permissible average daily concen-
tration is a criterion of the nontoxicity of a given concen-
tration of pollutant for humans. In the case of sulfurous
anhydride, the current maximum permissible one-time
concentration is 10 times higher than the maximum per-
missible average daily concentration, and in the case of ash
and dust, the current maximum permissible one-time
concentration is 3.33 times higher than the maximum
permissible average daily concentration. These standards,
while possibly economically justified in the case of existing
gas-scrubbing equipment and facilities, will only result in
the need for new "emergency capital expenditures" in the
future if they are applied to equipment and facilities now
being designed and constructed. The need to revise current
maximum permissible concentrations used in design stan-
dards is evident from calculations performed for actual
thermal electric power plants. The pollution levels per-
mitted by current maximum permissible one-time concen-
trations are unsafe and have been calculated without
consideration for various exacerbating meteorological fac-
tors such as high air temperature and extended periods of
calm or very low winds. It must also be remembered that
some Russian population centers experience these meteo-
rological conditions 3 or 4 months each year. If future
waves of "emergency capital expenditures" are to be
avoided, existing standards governing the technological
design of thermal electric power plants, the Construction
Standards and Rules [SNiP] governing boiler units and
thermal electric power plants, and the respective standards
governing other sectors must be revised. Specifically, these
documents must begin using the maximum permissible
average daily concentration in specifying standards for
gas-scrubbing facilities and equipment. The additional
up-front costs will more than be made up for in the long
run. Figures 3; references 6 (Russian).

Monoclonal Antibody-Based Immunoenzyme Assay for Determining Human Thyrotropin. 2. Design of an Immunoenzyme Test System for Determining Human Thyrotropin

[Article by Ye. R. Sigal, L. K. Koryazova, G. I. Kova-
levskaya, T. A. Pozdnyakova, Ye. Ye. Volobuyeva, V. Ye.
Samoylova, and R. G. Vasilov; Scientific Production Asso-
ciation (NPO) "Biotekhnologiya," Moscow, 117246; UDC
616.357:577.175.3:616.006-007:616.153.96-078.33]

[Abstract] Russian public health clinics are not equipped
with domestic kits for determining thyrotropin (TT) even
though there is a critical need for them in the diagnosis and
treatment of thyroid gland diseases. The goal of this
research was to develop a sensitive immunoenzyme test
system, based on high-affinity monoclonal antibodies
(monoAB), for quantitative determination of human thy-
rotropin. One monoAB was immobilized on polystyrene
microtitration plates; another was conjugated with horse
radish peroxidase (HRP). The analysis was technologically
effective, it was conducted in one step, and it took 2.5
hours to complete. The detection limit of TT was 0.1
$\mu IU/ml$. A highly sensitive three-step test system, utilizing
a streptavidin-biotin complex, was proposed that made it
possible to detect 0.01 $\mu IU/ml$ TT. Figures 4; references
14: 2 Russian, 12 Western.

Two-Site Immunoenzyme Analysis of Antibodies Against α-1 BG and α-2 BG Based on Column Immunoadsorption Chromatography

[Article by V. P. Chekhonin, I. A. Ryabukhin, T. B.
Dmitriyeva, V. V. Rynskov, L. T. Mikhalchuk, and L. Ye.
Breusenko; All-Union Scientific Research Institute (VNII)
of General and Criminal Psychiatry, Moscow, 119839;
UDC 543.544.42:57.083.3]

[Abstract] The recent discovery of two new neurospecific
proteins (NSP)—α-1 BG and α-2 BG—in human brain
extract has opened new horizons in the search for these
proteins and antibodies against them in the biological
fluids of patients with various neuro-psychiatric diseases.
In this work, a highly sensitive variant of immunoenzyme
analysis based on column immunoadsorption chromatog-
raphy (TIEAIC—two-site immunoenzyme analysis by
immunoadsorption chromatography) was developed for
quantitative determination of antibodies against α-1 BG
and α-2 BG (detection limit—0.35 ng/ml). The phenom-
enon of the presence of antibodies against the above-listed
proteins was identified in extreme conditions caused by
psychiatric diseases (36-42%), multiple sclerosis in the
active phase (16-29%), injuries (14-43%), astrocytomal
(14-33%) and oligodendrogliomal (18-40%) brain tumors,
as well as influenza (13%), intestinal infections (6-9%),
pneumonia (28%), and peritonitis and pancreatitis (25-
33%). The authors proposed that TIEAIC analysis of
antibodies against α-1 BG and α-2 BG may be used as an

auxiliary test for diagnostics and monitoring during the treatment of several diseases whose pathogeneses involve a breach in the blood-brain barrier. Figures 2; references 12: 5 Russian, 7 Western.

RNA-Ligase From Bacteriophage T4. IX. Synthesis of Oligoribonucleotides Containing the Initiation Codon on the 5'-Terminal of the Molecule With the Aid of an Immobilized Enzyme

937C0313C Moscow BIOTEKHNOLOGIYA in Russian No. 3, Mar 93 (manuscript received 13 Jan 93) pp 19-22

[Article by A. G. Venyaminova, L. V. Vratskikh, N. I. Komarova, M. N. Repkova, and V. I. Yamkovoy; Novosibirsk State University, 630090; Novosibirsk Institute of Bioorganic Chemistry, Siberian Department of the Russian Academy of Sciences; UDC 547.963.32.07]

[Abstract] Synthetic oligoribonucleotides with a predetermined heterocyclic base sequence are widely used as research tools for solving a number of problems in bioorganic chemistry and molecular biology. In particular, oligoribonucleotides containing the ApUpG initiation codon on the 5'-terminal of the molecule have found application as mRNA models in studies of ribosome functional processes. The most promising and universal method for preparative synthesis of short oligoribonucleotides is based on using immobilized T4 bacteriophage RNA-ligase for joining chemically synthesized triplets. In this work, the oligoribonucleotides $ApUpG(pU)_n$ and $ApUpG(pU)_n pUp$ were synthesized from oligoribouridilates via catalysis with immobilized RNA-ligase. The oligoribouridilates ere obtained from hydrolysis of poly(U) endonuclease from cobra venom and from ApUpG trinucleoside diphosphate that had been chemically synthesized by the phosphotriester method. Seven reaction cycles were carried out on one column with the immobilized enzyme. The end product yield varied from 4.9 to 18.0% after chromatographic purification. The structure of the obtained compounds was verified by chromatography with labels and enzyme hydrolysis down to the nucleosides. References 15: 12 Russian, 3 Western.

Solid Phase Enzymatic Synthesis of Oligonucleotides. II. Properties of Biogel P-300, Sepharose 4B, and Cellulose Hydrazides

937C0313B Moscow BIOTEKHNOLOGIYA in Russian No. 3, Mar 93 (manuscript received 25 Dec 92) pp 17-18

[Article by N. F. Trotskiy and V. I. Yamkovoy; Novosibirsk State University, 630090; UDC 577.113.6]

[Abstract] In order to improve solid phase enzymatic synthesis of extended oligoribonucleotides, the authors used biogel P-300, sepharose 4B, and cellulose hydrazides as substrates to immobilize tetraribonucleotides that had been oxidized with sodium periodate. The reactivity of $(pU)_3pU_{ox}$ and $(Ap)_3A_{ox}$ tetraribonucleotides immobilized on the above substrates was studied in solid phase ligation and phosphorylation reactions. The subscript "ox" indicates a sodium periodate-oxidized nucleoside residue with cleavage of the 2'-3'-C-C-bond. In this case, it was discovered that the greatest yield in both reactions was achieved

with the use of biogel P-300 and sepharose 4B. An advantage of sepharose 4B over biogel P-300 was that it had superior hydrodynamic qualities. References 7: 6 Russian, 1 Western.

Investigation of Phage Resistance and Plasmid Profiles in Industrial *Lactococcus* Strain Mutants Deficient in Their Ability to Ferment Sugars

937C0313A Moscow BIOTEKHNOLOGIYA in Russian No. 3, Mar 93 (manuscript received 9 Dec 92) pp 9-11

[Article by N. O. Molotova, V. I. Ganina, S. V. Molotov, and V. V. Sukhodolets; Scientific Research Institute (NII) of the Genetics and Selection of Industrial Microorganisms, Moscow, 113545; All-Union Scientific Research and Design Institute for the Dairy Industry, Moscow; UDC 579.253.4:57.063.8]

[Abstract] In a group of industrial *Lactococcus lactis*, subspecies *lactis* and *cremoris* strains, mutants were produced that were deficient in lactose, sucrose, and fructose utilization. Analysis of the plasmid profiles indicated an absence of plasmids 45-54 TPN in size in several mutants. From studying these mutants, the authors were able to identify the plasmids containing the genes for lactose, sucrose, and fructose fermentation in these microorganisms. Two strains, *L. lactis lactis* 90 and *L. lactis cremoris ROM*, were identified in which the mutants, deficient in lactose utilization, experienced phage resistance spectrum changes; in both cases, the changes consisted of the appearance of phage sensitivity with respect to various phages. In *L. lactis lactis* 90, the genes corresponding to lactose utilization and the genes participating in phage resistance control were apparently located on the 53.7 TPN plasmid. This work was completed, in part, with resources supplied by the Russian State Scientific and Technical Program "Priority Directions in Genetics." Figures 1; references 10: 4 Russian, 6 Western.

Morpho-Functional Characteristics of Macrophages in the Process of Reparative Myogenesis Under the Action of Immunomodulators

937C0439B St. Petersburg ARKHIV ANATOMII GISTOLOGII I EMBRIOLOGII in Russian Vol. 101 No. 11-12, Nov-Dec 91 (manuscript received 6 Dec 90) pp 35-41

[Article by M. I. Chentsova; Department of Histology and Embryology (director—Professor A. A. Klishov, deceased), Military Medical Academy imeni S. M. Kirov, Leningrad; UDC 611.018.21:612.017.1:616.74-005.9:599.323.4]

[Abstract] Electron transmission microscopy was used to study the ultramicroscopic structure of macrophages involved in the reparative regeneration of Wistar rat skeletal muscles after a mechanical injury. Two morpho-functional types were established, based on the ultramicroscopic features of the macrophages and morphometric characteristics of these cells' organelles. The first type included macrophages with a pronounced lysosomal apparatus and a large number of phagosomes that contained a muscular dendrite. They were responsible for phagocytic functions and facilitated debridement of tissue disintegration products from the wound. The second (secretory) type included cells with a developed granular endoplasmic

reticulum that could exert a regulatory influence on skeletal muscle reparative regeneration processes. Immunomodulators influenced the level of organelle development in both types of macrophages, which facilitated earlier initiation of regeneration processes and wound healing. Figures 3; references 22: 11 Russian, 11 Western.

Cytoskeleton of Cultured Spinal Cord Cells From Mouse Embryos

[Article by O. L. Berezovskaya; Department of the Physical Chemical Biology of Cellular Membranes (director— O. A. Kryshtal, corresponding member, USSR Academy of Sciences), Institute of Physiology imeni A. A. Bogomolets, Ukrainian SSR Academy of Sciences, Kiev; UDC 611.018.1:611.82.013:612.085.2]

[Abstract] The distribution and quantity of the main cytoskeleton proteins (actin, tubulin, neurofilamentous protein of molecular weight 160 kDa, and glial fibrillar acid protein) were studied by means of monoclonal antibodies (fluorescein isothiocyanate- and rhodamine-labelled) in various types of mouse embryo spinal cord cells cultured in monolayers. During the process of neuron development, tubulin moved from the neuronal soma into its processes. Tubulin's concentration varied among the processes. The authors hypothesized that the processes with higher tubulin concentration were more functionally active at those particular stages of differentiation. The total amount of tubulin should remain constant during a neuron's lifetime, however. The quantity and distribution of actin filaments in different types of cells varied. The actin content in neurons was lower than in glial cells and fibroblasts. Most of the protein (neurofilamentous, glial fibrillar acid protein) was concentrated in cell bodies and in proximal parts of the processes. The cytoskeleton protein distribution pattern in spinal cord cells was identified. Figures 4; references 17: 5 Russian, 12 Western.

EPIDEMIOLOGY, MICROBIOLOGY, AND VIROLOGY

Description of HIV Isolated From HIV-Infected Individuals and AIDS Patients in the CIS

[Article by D. N. Nosik, L. B. Kalnina, M. S. Bochkova, I. A. Kiseleva, R. V. Svirska, M. S. Petrova, A. O. Zhigulin, V. M. Stakhanova, Ye. A. Gushchina, O. G. Yurin, V. V. Pokrovskiy, L. V. Uryvayev, S. M. Klimenko, and D. K. Lvov, Institute of Virology imeni D. I. Ivanovskiy, Russian Academy of Medical Sciences and Central Research Institute of Epidemiology, Moscow; UDC 616.98:578.828].6-092:612.017.1.064]-012.5]

[Text]HIV, the etiological cause of AIDS, is characterized by a high degree of variability. The variability of HIV genes, combined with the latency phenomenon that is inherent in lentiviruses, enables the virus to elude the defense systems of the human body rather successfully 4, 6].

In western countries with the largest number of HIV-positive individuals and AIDS victims (USA, France, England, Germany), numerous HIV isolates were obtained differing in antigenic and molecular-biological properties [1, 3, 5]. The existence of two HIV serotypes was established: HIV-1 and HIV-2 [4, 6]. Immunodeficiency viruses were isolated from primates and cats that were very similar to HIV. With the appearance of HIV-positive individuals and AIDS cases in the former USSR, it became necessary to isolate and study the HIV strains circulating in this territory. For this reason, our objective here was to isolate and analyze the features of domestic HIV strains.

Material and Methods

Isolation of viruses. We obtained HIV isolates from peripheral blood lymphocytes (PBL) using a modification of the method in [1]. After PBL isolation with use of a ficoll-isopaque (Sweden) gradient, they were stimulated by phytohemagglutinin in a concentration of 5 µg/ml (Sigma, USA) for 48 h, eluted and cultivated in the presence of human interleukin-2 for 4-6 weeks or up to the time of cocultivation with lymphocytic and monocytic cell lines, as well as with PBL from healthy donors stimulated as described above.

Viruses. In addition to our isolates, we used HIV strains kindly furnished by Professor L. Montagnier: HIV-1/BRU, Professor Gallo: HIV-1/IIIB, and Professor J. Levy: HIV-1/SF4.

Cells. We used transferable human cell lines H9, Hut-78, CEM, MT-4, MOLT-4, CEM-SS, U-937, Jurkat tat and others, obtained from the collection of the Institute of Virology imeni D. I. Ivanovskiy, Russian Academy of Medical Sciences. The cells were cultivated in a concentration of 0.3-0.5 million per milliliter medium RPMI-1640 with 10 percent fetal calf serum, 300 µg/ml L-glutamine, and 100 µg/ml gentamycin, and incubated in suspension form. Viability of cells was determined by staining with 0.4 percent trypan blue.

Immunofluorescence. Cells that expressed HIV antigen on the surface were counted by the standard method using serum containing antibodies to HIV-1 from an AIDS patient.

Electron microscopy. After centrifuging at 2000 rpm for 5 min, cell sediments were collected and fixed successively in 2.5 percent glutaraldehyde solution and 1 percent OsO_4 in phosphate buffer, dehydrated and embedded in araldite. Sections were contrasted with uranyl acetate and silver nitrate using conventional techniques, then examined under an SEM-100B microscope.

Enzyme immunoassay. For direct enzyme immunoassay (EIA), we used a test system that we prepared for demonstration of HIV-1 antigens in culture fluid of cells infected with HIV-1 where antibodies to HIV-1 obtained from blood serum of AIDS patients were adsorbed in the solid phase. Peroxidase-tagged antibodies were obtained by binding immunoglobulins from the serum of HIV positive individuals (titer greater than 1:40,000 in the Organon test system) with armoracia peroxidase using the periodate method. EIA sensitivity constituted more than 2 ng/ml

viral antigen. We added up to 0.1 percent tween-20 to the specimens of material and applied them to wells in a tray. They were incubated for 18 h at 4°C, washed, conjugate in a 1:1000 dilution was added, then they were incubated for 1 h at 37°C. We eluted them, added substrate and measured absorption.

Reverse transcriptase reaction. The reaction was run in a lysate of precipitated virus (25,000 rpm, 1.5 h, lysis in buffer of: 50 percent glycerin, 7.5 mM HCl pH 7.5, 75 mM KCl, 1 mM DTT [dithiothreitol], 0.2 percent triton X-100). The reaction was carried out in a buffer of: 10 mM HCl (pH 7.5), 20 mM KCl, 2 mM magnesium chloride solution, 0.5 mM EDTA, 0.02 percent triton X-100, 0.2 mg/ml poly(rA)-digo(dT)$_{10}$ and ^{3}H TTP, 2 μCi per specimen. Incubation for 1 h at 37°C [1].

Polymerase chain reaction., isolation of DNA from cells. 1.5 ml cell suspension was precipitated, the sediment eluted 3 times in buffer at 4000 rpm for 30 min. We added 100 μl phosphate solution and saline buffer (pH 7.2) containing proteinase K in a concentration of 1 mg/ml. Incubation was carried out for 1 h at 55°C, for 16 h at 37°C, then heated for 2 min at 94°C.

The reaction was run using the following concentrations of reagents: dNTP mixture—200 μM each; primers—1 μM each; template—50 pg per sample; Tag enzyme - polymerase—4 U per sample, tris-HCl pH 9.3—10 mM; KCl—50 mM; magnesium chloride—2 mM; gelatin—0.1 mg/ml.

We used 25 cycles at the following temperatures: 2 min at 37°C—fusion, 5 min at 72°C—elongation, and 2 min at 94°C—denaturation.

4. Results and Discussion

Experiments for isolation of HIV isolates from material taken from HIV positive subjects and AIDS patients in 22 cities of the former USSR: Moscow, Elista, Leningrad, Rostov, Stavropol, Penza, Volgograd, Smolensk, Riga, Armavir, Donetsk and others. We obtained a total of 81 HIV isolates.

Effectiveness of HIV isolation constituted 29.1 percent in the case of asymptomatic carriers, 71.4 percent in HIV positive cases with generalized lymphadenopathy, and 90.5 percent in AIDS patients with severe manifestations of the disease.

Immunological analysis of the HIV isolates enabled us to determine that 79 out of the 81 HIV isolates are type I, 2 are type II and are HIV-2 strains.

We identified HIV isolates using several independent methods. At the early stages after HIV isolation, the virus was tested using enzyme immunoassay and immunofluorescence analysis, and we also measured reverse transcriptase activity in the culture medium.

Then we studied the HIV isolates using electron microscopy, the immune blot method and polymerase chain reaction. The test results are listed in the table.

Characteristics of HIV strains

Strain	Method						
	IIF, %	RT, counts/min	EIA	reproduction in cell lines (quantity)	CDE (days)	EM	PCR
HIV-1/IV1	7	35,000	+	10	6	+	+
HIV-1/IV3	24	27,000	+	8	5	+	+
HIV-1/IV12	2	1,800	—	1	12	—	+
HIV-1/IV13	17	177,000	+	5	8	+	+
HIV-1/IV14	2	1,700	—	1	—	—	+
HIV-1/IV17	43	41,000	+	9	9	+	+
HIV-1/IV19	6	1,500	—	2	8	+	+
HIV-1/IV21	39	68,000	+	8	5	+	+
HIV-1/IV39	53	43,000	+	7	4	+	+
HIV-1/IV54	13	20,500	+	4	12	+	+
HIV-1/IV73	8	11,000	+	3	10	—	+

Key: IIF) indirect immunofluorescence test; RT) reverse transcriptase activity; EM) electron microscopy; PCR) polymerase chain reaction; EIA) enzyme immunoassay; CDE) cytodestructive effect.

The data indicate that the first signs of HIV are demonstrable on the 7th-10th day of observation by determination of reverse transcriptase activity. Peak RT occurred on the 16th-19th day for many strains. The level of reverse transcriptase activity differed appreciably, depending on the isolated strain. It was possible to distinguish a second group of strains which demonstrated an RT peak on the 30th-35th day. The patterns of rise and decline in RT activity in peripheral blood lymphocytes coincided on the whole with detection of HIV antigen by EIA. After infecting transferable lymphoblastoid cell lines with HIV strains, maximum production of HIV antigen in culture fluid occurred on the 3d-5th to 12th-15th day, depending on the type of cell culture and HIV strain. Reproduction of isolates in sensitive cell lines was accompanied by a typical cytopathic effect. Most frequently, infected cells showed virus-induced fusions of cell membranes of giant "balloons" and syncytia. In other instances, there were no such structures; however, a strong cytodestructive effect was noted. The time of syncytia formation in infected cells depended on infectivity of the strains, and with highly infective strains they appeared on the 4th-5th day.

The cytopathic effect of viruses was demonstrable in the 2d-3d week after infecting the cell cultures in the case of 3 strains differing in infective activity. Formation of syncytia was correlated with expression of HIV antigens on the surface of infected cells, as demonstrable by indirect immunofluorescence. The number of cells with HIV antigens in the cell population ranged from 2-7 to 24-53 percent for HIV-1/IV3, HIV-1/IV17, HIV-1/IV21, HIV-1/IV39, and HIV-1/IV54.

Electron microscopy most often revealed HIV virions near the cell membrane or showed budding on it. Mature virions consisted of spherical particles 100-120 nm in size, with a pear-shaped, acentric core. Virions of a new HIV generation were demonstrable on the 3d day after infecting cells, while the maximum number of extracellular and budding viral particles was found on the 5th postinfection day. The spectrum of isolated HIV differed from that of cell cultures. A large group of strains was capable of reproduction only in a limited number of cell lines.

In some cases, HIV-1/IV5, HIV-1/IV7, HIV-1/IV11 and others were isolated from asymptomatic HIV carriers.

However, this pattern was not always observed and, in the case of HIV-1/IV13, HIV-1/IV24 and others from asymptomatic carriers, strains were obtained for which there was a wide spectrum of sensitive cell lines.

Some of the HIV strains had the capacity to grow on both lymphocytic and monocytic cell lines. In many cases, these were strains isolated from patients at the 3d-4th stage of disease, with marked symptoms.

It must be noted that, in addition to the capacity to multiply in different types of cells, the HIV strains demonstrated differing kinetics of viral production in cells of the same type.

Thus, the obtained HIV-1 isolates can be divided into two groups, having low and high productivity. The former group has a limited replicative capacity, low or negative RT and EIA. The second group is characterized by high infectivity (4.5-6.0 $TCID_{50}$), high RT, EIA, and capacity to multiply in various transferable cell lines.

Separation of strains into those with low and high infectivity is also typical of HIV isolated in Europe and the United States, which is indicative of the similarity of biological properties of our HIV strains and foreign ones [2, 5].

Comparison of characteristics and level of viral antigen production by cells infected with Russian, highly infective strains to reference strains HIV-1/IIIB, HIV-1/BRU, and HIV-1/SF4 revealed that they have the necessary properties to recover HIV antigen for diagnostic purposes.

Using a set of primers complementary to the sites of the gag and pol genes and the polymerase chain reaction, we obtained viral DNA fragments 2438 base pairs in size. The fragment was then spliced into the Blue script SK+ plasmid, TG1 cells were transfected, and clones were isolated with this fragment of the HIV genome. As a result of sequencing the DNA of HIV-1/IV54, it became possible to compare amino acid sequences of the gag protein fragment of this virus to the prototype foreign HIV-1 specimens [7].

The findings indicate that the homology of strain HIV-1/IV54 with HIV-1/MAL, which is typical for the African

content, constitutes 65 percent. Similarity to the North American strain HIV-1/MN constitutes 81 percent, which is indicative of somewhat greater resemblance of HIV-1/IV54 to the American HIV-1 subtype.

Studies of HIV strains isolated from HIV positive individuals from different regions of our country revealed that the HIV isolates were heterogenous.

Mainly the type 1 virus, HIV-1, is circulating among the population of Russia (98.1 percent); however, in the last 2 years HIV-2 infection has been noted among our citizens.

Thus, it can be noted that there is circulation in our country of HIV-1 and HIV-2, which differ in molecular-biological properties, but are similar in the main parameters to the prototype HIV-1 strains that are widespread in America, Africa and Europe.

References

1. Berre-Sinoussi, F., Mageyre, M., Dagnet, C., et al., SCIENCE, 1983, Vol. 220, pp 868-871.

2 Fenjo, E. M., Morfeldt-Manson, L., Chiodi, F., et al., J. VIROL., 1988, Vol. 62, pp 4414-4419.

3. Gurtler, L., EUROBIOLOGISTE, 1990, Vol. 24, pp 23-29.

4. Hahn, B. H ., Shaw, G. M., Taylor, M. E., et al., SCIENCE, 1986, Vol. 232, pp 1548-1554.

5. Levy, J. A., INF. DIS. CLIN. N. AMER., 1988, Vol. 2, pp 285-297.

6. Montagnier, L., ANN. INTERN. MED., 1985, Vol. 103, pp 689-693.

7. Sauermann, V., Schneider, S., Mous, S., et al., AIDS RES. AND HUM. RETROVIRUSES, 1990, Vol. 6, pp 813-823.

Principles of Biological Safety in Handling Pathogenic Microorganisms

[Article by L.S. Dzhindoyan and A.Ye. Naydeenov, Scientific Research Institute of Microbiology, Ministry of Defense, Kirov; UDC 613.636:616-078]

[Abstract] A common approach to safety in the handling of pathogenic microorganisms in microbiological laboratories is based on the probability of biological effects resulting from exposure to a microorganism or its metabolites. This approach also entails definition of socially acceptable risk vis-a-vis a defined endpoint, e.g., death. The suggestion is made that safety be calculated in terms of probability that protective barriers might be overcome by the pathogen per hour of work and be released into the working area. For microbiology laboratories concerned with pathogens the recommendation is made that the acceptable probability for such an event be set at 10^{-8} h^{-1}. Figures 3; references 22: 10 Russian, 12 Western.

Characteristics of Influenza B Viruses Responsible for 1990-1991 Soviet Epidemic

[Article by V.T. Ivanova, M.A. Yakhno, T.A. Oskerko, L.I. Golubeva, N.I. Dzhaparidze and A.N. Slepushkin, Institute of Virology imeni D.I. Ivanovskii, Russian Academy of Medical Sciences, Moscow; UDC 616.98:578.832.1]-078.33]

[Abstract] Extensive serologic analysis of influenza viruses isolated during the 1990-1991 epidemic in Russia led to the identification of two strains of influenza B virus as the etiologic agents: B/Victoria/2/87 and B/Yamagata/16/88. The two groups of isolates represented different branches of the viral evolutionary tree and displayed extensive antigenic and biological heterogeneity. Tables 1; references 7: 2 Russian, 5 Western.

MEDICINE AND PUBLIC HEALTH

Mathematical Modeling of Thermochemical Processes During Thermokeratocoagulation

[Article by S. N. Fedorov, A. I. Ivashina, Ye. G. Antonova, N. K. Korshunova, N. A. Bozhkov, V. M. Karpov, and G. A. Bezruk; MNTK "Mikrokhirurgiya glaza" [Eye Microsurgery], Moscow; UDC 617.753.1-089:612.015.35]

[Abstract] Studying the processes of compound heat transfer and biochemical transformations in the coagulated area are of fundamental importance in providing a scientific framework for surgery, predicting its outcome, optimizing its conditions, and reducing post-operative complications. This paper discusses a mathematical model of thermokeratocoagulation in terms of thermochemistry and shows how operating conditions may affect the size of the tissue damage zone. The authors developed the TERMO-K program system for the IBM PC AT to run their model. The user inputs data about the operating conditions and the design features of the needle, and the model predicts the size and character of the resultant tissue damage zone by simulating the thermal coagulator operation. From the model, the authors found linear relationships between increases in the initial needle temperature and the exposure time and tissue damage. They also found a positive correlation between the radial size of coagulation and its volume. In a comparison of modeled results with experimental studies, the authors found qualitative agreement in the effects of initial needle temperature on the radial size of coagulation. The thermochemical model and the TERMO-K system can be used to refine the thermokeratocolagulation procedure and may be adapted for analysis of intrastromal keratocoagulation, laser coagulation, keratoconus therapy, and other surgical techniques involving thermal effects on the cornea. Figures 6; references 17: 10 Russian, 7 Western.

Tissue Damage Caused by Thermokeratocoagulation

[Article by S. N. Fedorov, A. I. Ivashina, Ye. G. Antonova, N. K. Korshunova, N. A. Bozhkov, V. M. Karpov, and G. A. Bezruk; MNTK "Mikrokhirurgiya glaza" [Eye Microsurgery], Moscow; reply to article "Experimental Radial Thermokeratoplasty in Rabbits" by S. T. Feldman, W. Ellis, J. Frucht-Pery, A. Chayet, and S. I. Brown; UDC 617.753.1-089]

[Abstract] In the course of conducting theoretical and experimental studies of the histopathological effects of thermokeratocoagulation on rabbit corneas, the authors found a similar American study (Feldman, et al.) to be erroneous in its conclusion that thermokeratocoagulation is inadequate in terms of safety and efficacy. In this work, the authors found that thermokeratocoagulation is relatively safe and that severe tissue damage is primarily caused by improper insertion of the needle into the cornea. The authors also found that the use of thermal effects in ophthalmic surgery calls for a very precise application of data obtained from animals to humans, i.e., thermocoagulation conditions designed for humans cannot be automatically applied to rabbits, which was the mistake made by the Americans. They also concluded that using mathematical simulation in ophthalmosurgery will substantially facilitate the analysis of specific surgical processes, greatly reduce costly and time-consuming medical and biological studies, and provide for more accurate predictions of the outcome of operations, including the transition from animal to human experiments. The computerized TERMO-K modeling program (IBM PC AT) developed by the authors successfully predicted the American ophthalmologists' results, which was additional proof of the program's scientific and educational applicability. Figures 9; references 5: 4 Russian, 1 Western.

Hyperbaric Oxygenation Treatment for Deafness

[Unattributed article under the "Hope" rubric: "Children Will Hear!"]

[Text] In Russia a brand new unique method for treating acute deafness in children has been developed. Staff members at Russia State Medical University have had success with the method in 67 percent of cases. Throughout the world, the results of treating this pathology are virtually nil.

Staff members in the Hyperbaric Oxygenation Laboratory (that is, treatment in baric chambers under elevated or reduced oxygen pressure) working under the direction of Professor Sergey Baydin developed their own original method to solve the problem.

In a conversation with an ITAR-TASS correspondent, Sergey Baydin emphasized that only acute deafness is cured. In other words, the treatment is effective only during the first 3 weeks after the onset of decrease or loss of hearing. To date, in other cases it has only been possible to halt the process' development. "There are many reasons for the development of deafness in children," said Sergey

Baydin. "Included among them are catarrhal illnesses, nervous stresses after family rows, and overdoses of drugs (especially antibiotics)."

The treatment is conducted in domestic baric chambers. In addition to using their new method to treat deafness, the physicians have learned to use it to manage critical diseases in neonates. Special chambers have been designed and constructed for this. In adults, hyperbaric oxygenation has proven effective against cardiovascular diseases, conditions following myocardial infarction, stomach and duodenal ulcers, and purulent tissue lesions. In many cases, treatment in baric chambers makes it possible to avoid using drugs or keep their use to a minimum.

Moscow Spinal Trauma Hospital To Become a Commercial Center

947C0118B Moscow ROSSIYSKIYE VESTI in Russian No. 39, 8 Sep 93 p 6

[Article in "Retsept" [Prescription] subsection by L. Sorokina: "Conflict That Could Not Be: "For the Sake of Order" Officials Transformed Unique Treatment Into Regular Polyclinic Only To Again Make It a Center"]

[Text] And the story began as follows. At the end of last year, the Main Medical Administration in Moscow decided to bring order to the capital's medical institutions. Those institutions that had previously had the status of all-union institutions became the stumbling block. The Russian Ministry of Health sheltered some of them. It was proposed that the others become Moscow polyclinics.

The unique Center for the Rehabilitation of Invalids and Patients With Spinal Trauma, which is headed by living legend Valentin Dikul and which is the only one of its kind not only in Russia but in the entire former USSR as well, fell among these "others." The "Retsept" wrote about it in detail in the past once. I will therefore recall just one fact: For its well-known services, Dikul's center was listed in the World Register of Medical Institutions.

Moscow's central medical board dealt with this unique institution as follows: It decided to reshape it into an ordinary Moscow polyclinic with its associates given a rank 5 salary.

What did this mean? First, specialists who knew a rare method incurred a big salary loss. Second, the polyclinic had to accept primarily Moscow residents and had to refuse to help patients from other regions. And third, the center's director V. Dikul found himself thrown overboard: The polyclinic's staff roster did not contain the post of director, and a medical education was required for the chief physician (Dikul never finished his).

The stand-off between the center and Moscow's medical board continued for more than half a year. The public sided with Dikul and his associates. Such prestigious individuals as Yu. Nikulin, M. Zakharov, Y. Yevtushenko, and many others wrote to Moscow's mayoralty and the federal government. The stand-off could not but affect the rehabilitation center's activity: It had to cut back the number of Russian patients accepted to only the most critical, and even those Moscow patients who did not fit the center's profile—those with radiculitis, osteochondrosis, etc., had to be accepted.

The public was not pressured, and the mayoralty to whom it appealed and medical officials made concessions. They proposed that Dikul write a letter in which he would ask to be under the "wing" of the central medical board but as the Moscow rehabilitation center. In other words, the version that Dikulev's supporters proposed half a year ago was revived.

Who needed all this idle fuss? I cannot document it, but perhaps something will clarify this curious information. "Buyers" who are not hiding their intentions came to the rehabilitation center. While examining the "goods" (the building), they said that they find it entirely suitable as a commercial health improvement center: Luckily, there is a pool and rooms for training equipment, and a magnificent park with an athletic field in the neighborhood. To the question of their "aims," the "buyers" answered significantly: The land, they say, is full of rumors...

This time the public, with the help of the capital's mayoralty, uncovered the source of the rumors. This time. But there is no guarantee that a similar situation will not be repeated with other commercial-type medical institutions. To sell is not to build.

Child Health Concerns in CIS Republics

Remarks of Russian Health Minister

937C0292A Moscow DELOVOY MIR in Russian 18 Feb 93 p 16

[Article by ITAR-TASS: "Mother and Child Care—93"]

[Text]The birth and upbringing of a child are the most important problems in the area of motherhood and childhood. The international exhibit on "Mother and Child Care—93," which opened in Moscow, proposes to solve them by means of the latest medical technologies.

In his remarks at the opening of this exhibit, Eduard Nechayev, Russian Federation health minister, stated that the problem of mother and child care in Russia is presently one of the top priorities. For expressly this reason he considers this exhibit to be very important. The minister expressed his hope that this will be instrumental in development of a system of mother and child care in our country.

The indicators characterizing obstetric care in Russia are lower than those of a number of foreign countries: mother and infant mortality rates, as well as morbidity rates for children and pregnant women, are high. The incidence of abortions also remains high. In the opinion of Nikolay Vaganov, Russian Federation deputy health minister, all this is attributable, to a considerable extent, to the flaws in obstetric technologies, intensive care and resuscitation of neonates, as well as shortage of drugs. The deputy minister mentioned that one of the ways to solve this problem is for Russia to set up joint production of equipment and drugs with western firms.

The "Mother and Child" exhibit offers modern equipment, instruments and drugs used in gynecology, obstetrics and pediatrics.

Interview Reflects Concern About Child Morbidity

937C0292B Moscow PRAVDA in Russian 25 Mar 93 p 3

[Interview with Doctor L. F. Berezhkov: "A Doctor's Heartache—Every Other Child in the Russian Federation Has a Chronic Illness"; first paragraph is PRAVDA introduction]

[Excerpts]Leonid Fedorovich Berezhkov, doctor of medical sciences and professor, heads the Department for the Study of dynamics of Schoolchild Health Dynamics, Scientific Research Institute of Hygiene and Prevention of Diseases of Children, Adolescents and Young People, of the RF Goskomsanepidnadzor [State Committee for Sanitary and Epidemiological Oversight]. Our correspondent asked him to answer a few questions.

[Question]How do you generally assess the physical condition of the youngest Russian citizens?

[Answer]Unfortunately, there is little reason for optimism. More than half of all schoolchildren suffer from chronic diseases. In essence this refers to pathology of the nasopharynx, digestive organs, nervous system, anemia and allergies.

[Question]What do the scientists predict for the next few years?

[Answer]Frankly speaking, nothing good. In view of deterioration of ecological conditions, we should expect a rise in both acute and chronic diseases, particularly allergies, bronchial asthma, and dermatitis. Worsening of nutrition will lead to being underweight, retarded growth, sexual development, anemia, and diminished constitutional resistance. The more stress situations there are, the more often we will encounter mental diseases, poorer immunity, physical development, pathology of digestive and hemopoietic organs.

[Question]You mentioned the impact of ecological conditions on child health. In what regions are there more sick kids?

[Answer]There are the fewest healthy children in the Central-Chernozem region (33 percent), Volga region (39 percent), the Far East (41 percent), while the best regions are: North Caucusus (55 percent), North-West (54 percent), and Kaliningrad (51 percent). The largest number of children with chronic disease are in Moscow and St. Petersburg. The children of the Urals and West Siberia do not enjoy good health.

Moscow Educator Comments on Sick Children

937C0292C Moscow NEZAVISIMAYA GAZETA in Russian 13 Mar 93 p 6

[Article by RIA: "Sickly Children"]

[Text]Lyubov Kazina, head of the Moscow Department of Education, states that "48 percent of the children in Moscow cannot be called essentially healthy. A total of 260,000 children suffer from serious chronic pathology, which means that about every sixth child is affected. Statistics show that the physical condition of children worsens in school. Thus, less than 1 percent of the children have postural disturbances in nursery schools, and by the time they are in second grade, the figure rises to 4 percent. In the lowest grades, visual impairment is observed in almost 6 percent of the schoolchildren, and by the eighth grade, this applies to 21 percent."

Kazakhstan Deputy Health Minister Comments on Child Health

937C0292D Alma-Ata AZIYA (MEZHDUNARODNAYA GAZETA) in Russian No. 5, Feb 93

[Article by Aman Duysekeyev: Infancy Is a Happy [preceding word crossed out] Dangerous Age"; first paragraph is AZIYA introduction]

[Text]As already written in the AZIYA newspaper, an international seminar was held recently in Alma-Ata which discussed problems related to mother and child health. This was followed, in the same place, by another seminar organized by UNICEF, the Kazakhstan Ministry of Health and the Bobek Children's Charitable Fund. This time, the talks revolved around the subject of a program of controlling pneumonia among children in Kazakhstan. What prompted such representative meetings of physicians in Alma-Ata? At the newspaper's request, Aman Duysekeyev, deputy health minister of the Republic of Kazakhstan, shared his thoughts:

First, let me cite some figures: in our republic 40 children are born per hour, but there is also one death per hour, which is indicative of high infant mortality. Analysis of child morbidity revealed that it has risen everywhere. For example, the highest incidence of infectious diseases is noted in Kzyl-Orda and Mangistau oblasts, and the city of Alma-Ata. Most often, blood and hemopoietic organ diseases are detected in the above-mentioned oblasts, as well as Semipalatinsk Oblast. In our opinion, the rise in morbidity among tots is related, first of all, to the poor ecological situation in this republic and worsening of the people's socio-economic status.

Infant mortality is one of the most sensitive indicators of socio-economic development of society, which comprises the educational and cultural level, condition of the environment, efficacy of preventive measures, medicogenetic consultations, availability and quality of medical care, distribution of social and material wealth. It has been established that the highest indictors of infant mortality are observed in oblasts with a high birthrate, since they have the poorest obstetric and pediatric care resources, and lowest per capita consumption of basic foods. And this enables us to conclude that planning of resource capabilities of mother and child care services was carried out for many years without consideration of the regional distinctions (in the sense of high or low birthrate). True, for the last few years emphasis has been placed on the regional conception of distribution of resources. But the difficult socio-economic situation, reduction in funds allocated to medicine from the State budget have diminished the capacity to carry out the work that was begun. Yet we are dealing with children. Today, more than ever, safeguarding their health requires effective government support.

What else causes infant mortality? Studies carried out by the Kazakh Scientific research Institute of Pediatrics show that the more abortions are used as a birth control method, the higher the gynecological pathology, the more often there are complications of pregnancy, considerable share of premature infants, while the risk of infant mortality increases 20-fold.

The physical condition and morbidity rate of children, particularly in infancy, is also directly related to how they are fed. Yet requirements such as keeping mother and infant together in maternity homes, and immediate nursing of the infant are not followed actively enough in Kazakhstan. And this can ultimately lead to catastrophic rise in number of infants deprived of maternal milk. Even now, in this republic only half the infants up to the age of 3 months and one-third of those up to 6 months old are breast fed. This cannot fail to cause alarm. Especially since the prognosis is depressing, since Kazakhstan does not have its own baby food industry, and support of breast feeding involves major socioeconomic difficulties.

In most of the world's nations, including CIS states, prevention and treatment of respiratory diseases is one of the pressing socio-medical problems. In our republic, for example, bronchopulmonary pathology among children constitutes more than 64 percent of all diseases. Thus, the rise in incidence of acute pneumonia among tots in Atyrau, Zhezkazgan, Kzyl-Orda and South Kazakhstan oblasts is attributable to inadequate supply of necessary equipment to the roentgenological service, difficulties in making the exact diagnosis, and problems of professional training of pediatricians, particularly on the primary level.

The high incidence of pathology of respiratory organs among children is related not only to unsolved medical, but also socioeconomic, ecological and ethnic problems. For this reason, only a comprehensive approach is needed to solve this problem. In recent years, many scientists have concluded that it is important to instruct mothers on first medicosanitary aid. As shown by studies, the education of moms was instrumental in establishing a health lifestyle, expanding knowledge about acute respiratory infections, and helped lower infant mortality by 29 percent. Consequently, we consider primary prevention and hygienic education of the public to be the chief role of out-patient and polyclinic institutions.

At this stage of economic and social transformations, and with changing demographic processes, the most important task to health care practice is to preserve the life of every infant. And I should like to state through AZIYA, which devoted a page in its preceding issue to the problem of mother and child health the following: everything we discussed above will be only a good intention unless funding of health care in Kazakhstan is carried out on the basis of scientifically validated forecasts and more generous investment in programs that guarantee the health of children and women.

Asian CIS Health Officials Comment on Women's Health

937C0292E Alma-Ata AZIYA
(MEZHDUNARODNAYA GAZETA) in Russian No. 4
Feb 93 p 4

[Article by Zoya Korneyeva and Dinara Shugabayeva (AZIYA correspondents): "The Health of Women is the Health of the Nation"; first three paragraphs are AZIYA introduction]

[Excerpts]Pregnancy and birth of a child must be not only usual, natural, but also virtually safe and definitely joyous events. However, statistics show that this is far from true

in many developing countries. Each year, about a million women die of complications arising during pregnancy and parturition. In the same countries, 10 million children die each year, and about half of them in the first month of life. Many children expire of the same complications that killed their mothers. These complications are directly related to the condition of maternity institutions, general physical condition of mothers and their diet even before they become pregnant.

As we have already reported, there was a seminar in the middle of January in Alma-Ata dealing with mother and child health. The US Agency for International Development (USAID) sponsored this seminar. The seminar assembled more than 70 Central Asian health care workers and many prominent foreign specialists. The purpose of the seminar was to learn and exchange information with participants from the United States and Central Asia about the latest facts on matters of mother and child care, nursing and family planning.

This is what the seminar participants told AZIYA correspondents.

Aman DYUSEKEYEV, deputy health minister of Kazakhstan:

In our republic, the index of women's health is dropping each year. Last year it constituted about 30 percent. This means that only 30 women out of 100 are in good health. Out of 1000 infants born, 146 are sick. Respiratory organ diseases are in first place, parasitic diseases in second, and nervous system diseases in third. The adverse ecological situation and deteriorating financial status of the people have an adverse impact. We are in second place among CIS states with respect to birthrate. In our republic there are 67.2 maternal deaths per 100,000 deliveries. Of this number, 38 die of abortions. Infant mortality is high in Shymkent, Semipalatinsk, Zhambyl and Kzyl-Orda oblasts. These indicators are considerably lower in northern oblasts. At present, development of a 5-year program to lower infant and mother mortality is being finalized in our republic. The government of the Kazakhstan Republic has spent much money to purchase drugs. In the summer, there will be a conference in Alma-Ata on the problem of diarrhea.

Nina KAYUPOVA, director of Republic Research Center for Mother and Child Care:

Our Center, along with other research institutions of Kazakhstan, has carried out sampling studies. As a result, it was found that morbidity is very high among women in the region of Aral, Semipalatinsk, and oblasts with a large chemical industry—Pavlodar, Zhambyl. The poor ecological situation is in first place among the causes of disease, child and mother mortality. We have developed a program to lower maternal morbidity and mortality which considers all risk factors. The heterogeneity of indicators of morbidity and mortality made it necessary to elaborate differentiated preventive and therapeutic measures to lower them. Kazakhstan is divided into four regions according to indicators of maternal mortality: low, average, above average, and high. Thus, the indicator is high in Shymkent and Alma-Ata oblasts, and in the city of Alma-Ata. It is low in Ural and North Kazakhstan oblasts. It should be noted that the quality of medical care plays a

part in solving the problem of prevention of maternal death and morbidity. It is very obvious that we need to improve training and retraining of medical personnel. We are particularly alarmed by hereditary and congenital pathology of neonates. To solve this problem, a network of medicogenetic consultation offices has been organized in Kazakhstan. In our republic, much is being done to safeguard mother and child health: several laws have been passed that are aimed at improvement of labor safety and everyday life of women; institutions of a new type have been build—perinatal centers, new maternity homes and gynecological consultation offices have been opened.

Estimate of maternal mortality rate (deaths per 100,000 live births)

Republic	Percentage
Kazakhstan	67.2
Kyrgyzstan	71.0
Uzbekistan	72.0
Turkmenistan	73.0
Tajikistan	75.2

Sergey PUGACH, scientific associate at the Kazakh Scientific Research Institute of Pediatrics:

In Kazakhstan, mortality of infants and very young children is an important problem. Infectious pathology is one of the chief causes of maternal mortality and child mortality. Southern and western regions are characterized by higher infectious morbidity and mortality among children up to 3 years old. On the whole, in the republic, intestinal infections are in first place, sepsis in second, and meningococcal infection in third. The high morbidity level is related to unsatisfactory development of the social infrastructure, poor sanitation of populated centers, particularly rural ones, flaws in organization of potable water supply to the public, absence and unsatisfactory operation of sewer systems, water treatment installations, and inadequate role of the sanitary and epidemiological service.

The leading risk factors of mortality are medical organizational which are controllable (68.7 percent), then social (16.1) and biological (15.3). The most important medical organizational factors are: incomplete examination, lack of regularity in preventive observation, lack of urgent therapy at the prehospital stage and laboratory tests, extremely serious condition of patients when admitted, which is related to late hospitalization. The leading social factors reflect the sociodemographic distinctions of the region studied: large families (housewife mother), low level of mother's education, flaws in child care (no massage or exercise). The prevalent biological factors are: physical condition of the mother (anemia), inadequate postpartum rehabilitation related to short intervals between pregnancies, which is also the cause of low weight of the child. In all regions as a whole, 67.1 percent of deaths were deemed preventable.

Lyudmila RYBALKINA, deputy director of the Kyrgyz Scientific Research Institute of Obstetrics and Pediatrics:

In our republic, infant mortality is high, 31.7 per 1000 births. Maternal mortality constitutes 71 per 100,000 deliveries. There are many causes involved and, first of all,

the initially poor physical condition of women of childbearing age which, in turn, is attributable to the difficult ecological situation and overuse of chemicals in the soil. Our women work in cotton and tobacco raising regions. One often observes women nursing infants right under the tobacco-drying awning. The Institute of Obstetrics and Pediatrics carried out studies in regions where there is particularly intensive use of pesticides and chemicals to stimulate growth of crop. We took blood and milk samples for testing from pregnant and nursing women. We found a close correlation between physical condition and environmental pollution. For example, 16 percent of the girls presented retarded sexual and physical development, 20 percent of the women revealed instances of sterility and premature delivery of infants. In such regions, the children suffered from hypotrophy.

Talaybek BUYLASHEV, deputy director of the Kyrgyz Scientific Research Institute of Obstetrics and Gynecology:

In our republic, as a rule, the number of children desired was born to the detriment of the mother. In 70 percent of the cases, mothers of many children suffered from anemia, parturition-related hemorrhages, and late toxicosis. In Kyrgyzstan, in urban areas, 30 percent of the women are multipara, and in rural areas, they constitute 50-55 percent. About one-third of the number of annual maternal deaths is referable to multipara from socially deprived families. In our republic, abortion has been the main form of family planning. There were 48 abortions per 100 births. The ethnic lifestyle distinctions made it necessary to search for new approaches to sociomedical aid to the family. For this reason, a new family planning and social protection service was created in Kyrgyzstan in 1989. The tasks for this service are to plan families and disseminate information about a healthy lifestyle, education, social and legal protection of families in the risk group. Of course, we realize that every family should decide on its own how many children it must have. But there must be an interval of 2.5-3 years between them. At present, there are more than 56 family planning centers in this republic. Maternal mortality has dropped from 81.6/100,000 births in 1990 to 76.4 in 1991. There has been a drop to one-third in percentage of women who give birth after the age of 30 years.

Khamgeldy MAMEDOV, deputy health minister of Turkmenistan:

We have the highest mortality rate, as compared to other regions of Central Asia. The chief cause is the high birthrate. More than 80 percent of Turkmen women of child-bearing age are sick. Seventy percent of the pregnant women are anemic. The indicator of respiratory and intestinal diseases is very high. The ecological situation in the republic is poor. Tashauz and two rayons are in the Zone of the Aral disaster. Toxic chemicals that were used at one time are undermining the health of women. We raise a cotton monoculture, which requires an enormous volume of manual female labor. There are no healthy women wherever cotton is raised. This means that there are no healthy offspring either. The water shortage in some regions and lack of municipal services are also devastating factors.

In our region, servicing rural health care is an urgent matter, since the highest percentage of deaths is referable to residents of rural areas. It is difficult for Americans to comprehend that, for us, the main thing is to improve the material and technical base, and specialists. While in the United States midwives manage to perform their duties very well, in or country, the physician replaces both a midwife and nurse. We are also experiencing a severe scarcity of information. Nor are all opportunities used to run campaigns for a health lifestyle.

Free nutrition has been organized in Turkmenistan for pupils in the 1st-4th grades. Free drugs are furnished for infants up to 1 year old. Women are given 140 calendar days of leave before and after parturition, and the term is increased by 16 days for those with pathology.

Svetlana NARZYKULOVA, chief obstetrician-gynecologist of the Uzbek Ministry of Health:

Of all women, the Asian woman is probably in poorest health, since the intervals between her children are the shortest. Our women give birth twice a year. About 70 percent of them suffer from extragenital pathology, and the lion's share is represented by anemia.

Women and children work in cotton fields, yet cotton contains many toxic chemicals. Not to mention the heavy labor involved in picking cotton. There is persistence of many toxic chemicals, which break down under the open sky. Hence the high levels of pesticides in mother's milk and the low frequency of breast feeding. As it is everywhere else, the ecological situation is "sounding an alarm." Uzbekistan has its own Chernobyl, the Aral zone.

As yet, maternal mortality is still high, but there has been a trend toward decline in recent years. Thus, while it constituted 73.3 in 1990, it was 65.3 in 1991, and according to estimates for 11 months, it dropped to 51/100,000 viviparous women last year. In 1991-1992, we carried out a program entitled "Urgent measures to improve the health of fertile women (from 15 to 49 years old)," because we have a large group of multipara. Teams equipped with the necessary instruments traveled to rural mountainous regions. General practitioners and gynecologists made observations. The women who required skilled care were referred to central medical institutions.

D. ASADOV, director of the Uzbek Scientific Research Institute of Obstetrics and Gynecology:

Until recently, there were four countries in the world that did not support the campaign for family planning. They included the former Soviet Union. For this reason, it is quite understandable that we are just learning about a concept such as "family planning." Are our people ready for family planning? At present, such terminology is not grasped in Uzbekistan. Evidently, planning in different industries in former years left its negative impact. We call it "improving the health of children and mothers." First of

all, our institute polled public opinion, men and women separately. Ten years ago, 70 percent of the women and 100 percent of the men believed that a family should have 6-7 children or, as they say, "as many as God gives us." Today, 55 percent of the women agree that there should be 2-3 children in a family. This is the belief of Muslims: Uzbek, Kazakh, Tajik and Kara-Kalpak women. More than 50 percent of the men believe that there should be 3-4 children. Contraceptives are already used by 80 percent of the women and 50 percent of the men. The population is morally ready to grasp the concept of family planning. At present we are, so to speak, rethinking our ideology, because the issue is still new to us.

Health Status of Children in the West Siberian Region

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[Article by Yu. P. Nikitin, D. V. Denisova, A. S. Tomilenko and V. I. Vetkov, Institute of Therapy, Russian Academy of Medical Sciences, Novosibirsk; UDC 616-053.2:313.13(470)]

[Text] Child health has always been a problem of paramount importance to Russia. Under present conditions of profound economic crisis, it causes justified alarm, not only on the part of physicians, but also each sensible person concerned about the fate of his country.

The health status of children, and levels of a number of demographic indicators are a barometer of socio-economic development of a territory. Infant mortality (number of deaths at up to 1 year of age per 1000 live births) is one of the most sensitive health indicators, and it is related to many causes: social, ecological, ethnic and a number of others. The former USSR was in the lead among economically developed countries of the world in infant mortality: this indicator constituted 21.8/1000 in 1990 [9]. In the same period, infant mortality in Japan was only 4 cases per 1000 live births, it was 6 to 9 in West Europe, and 10 in the United States [6]. This indicator is highest in African countries (179 in Gambia, 105 in Nigeria), as well as Turkey (79) [19]. In the opinion of WHO experts, infant mortality in excess of 50/1000 begins to have a slowing effect on development of a nation [16].

In the former USSR, infant mortality presented vivid territorial differences: in 1989 it was 10.7/1000 in Lithuania, 54.7 in Turkmenia, and 17.8 in RSFSR [6].

For a long time, infant mortality was rather high in all parts of West Siberia, but in the last 10 years it was close to the republic mean (Table 1). The rate of decline diminished in the last few years. Evidently, organizational and medical measures alone are not enough; there must be development and implementation of a set of health-improving programs, first of all, sociohygienic and ecological ones.

Table 1. Infant mortality in West Siberia in 1980-1990 (per 1000 live births)

Territory	1980	1985	1990
Altay Kray	24.8	17.1	17.0
—urban	23.0	16.5	17.2
—rural	26.6	17.6	16.7
Kemerovo Oblast	27.8	20.8	23.7
—urban	20.8	19.6	20.1
—rural	34.3	27.8	26.6
Novosibirsk Oblast	23.2	19.3	18.8
—urban	23.1	18.2	17.8
—rural	23.5	21.7	21.5
Omsk Oblast	23.2	22.0	17.3
—urban	22.3	22.0	17.2
—rural	24.4	22.3	17.4
RSFSR	22.1	20.7	17.4

The lowest infant mortality is noted in Altay and the highest, in Kemerovo Oblast. This difference is related first of all to the ecologically adverse situation in the Kuznetsk Coal Basin and the fact that many women work under difficult industrial conditions that are deleterious to health. Altay Kray is thus far the ecologically best territory of West Siberia.

There are also differences between urban and rural areas with regard to infant mortality rates: in 1990, this indicator constituted 17.3/1000 in cities of the Russian Federation and 18.9 in rural areas [6]. On the whole, the same ratio prevails in West Siberia.

In most cases (85-90 percent), infant mortality in the Russian Federation is attributable to four classes of causes: infectious diseases (class I), diseases of respiratory organs (class VIII), congenital developmental defects (class XIV) and conditions arising in the perinatal period (class XV). In the last 10 years, there were some major changes in the structure of infant mortality (Table 2). In 1980, in the Russian Federation there was prevalence of respiratory organ disease among causes of infant death and in 1990, perinatal pathology.

Table 2. Structure of infant mortality in Western Siberia (percentages)

Territory	Class of causes	Oblast		Urban		Rural	
		1980	1990	1980	1990	1980	1990
Altay	I	15.6	8.8	19.6	8.1	12.1	9.0
	VIII	38.4	16.5	28.4	12.8	47.1	21.0
	XIV	14.4	19.4	13.1	21.3	15.5	22.2
	XV	16.9	43.5	27.7	53.5	7.5	29.3
	Other	14.7	11.8	11.2	7.3	17.8	18.5
Kemerovo	I	23.0	7.9	23.0	7.1	21.2	8.1
	VIII	37.4	13.1	37.5	12.3	52.8	19.3
	XIV	15.0	13.8	14.9	21.2	11.1	15.6
	XV	16.4	49.5	16.3	49.1	5.0	38.1
	Other	8.2	16.7	8.3	9.3	9.9	18.9
Novosibirsk	I	16.6	7.9	15.7	6.2	24.9	11.6
	VIII	43.0	18.7	37.0	15.3	57.3	23.2
	XIV	12.6	24.3	15.8	29.9	7.1	16.5
	XV	19.8	34.4	23.1	37.7	6.1	28.9
	Other	8.0	14.7	8.4	9.9	4.6	19.8
Omsk	I	20.7	10.0	23.0	11.6	17.6	7.1
	VIII	42.2	15.8	30.9	14.8	54.8	17.6
	XIV	11.9	24.7	13.1	24.4	10.3	25.2
	XV	15.1	40.8	23.2	42.6	4.5	37.6
	Other	10.1	8.7	12.8	6.6	10.6	12.5

Note: Class I, infectious diseases; class VIII, respiratory diseases; class XIV, congenital developmental defects; class XV, perinatal pathology

In the structure of causes of perinatal mortality in Russia (number of infant deaths in the period from 28th week of gestation period to 7 days after birth per 1000 live and still births), asphyxia is in first place (51 percent), respiratory disorders are in 2d (18 percent), congenital defects in 3d (13 percent), and birth trauma in 4th (8 percent) [2]. In 1988 there was a large number of term infants among those who died in the perinatal period—52 percent. In developed countries this indicator does not exceed 25 percent [2]. In the last 10 years, perinatal mortality rate also rose in the West Siberian region. It rose from 13/1000 in 1982 to 21/1000 in 1990 in Novosibirsk Oblast.

The structure of infant mortality in West Siberia as a whole is the same as in the Russian Federation. While the leading cause of infant death here was respiratory disease in 1980 (37-43 percent), with infectious diseases in 2d-3d place (16-23 percent), in 1990 perinatal pathology advanced to first place (34-50 percent) and congenital defects in 2d; respiratory disease moved to 3d place and infectious diseases, to 4th. These data confirm the conclusion that there is a decline in reserve for lowering infant mortality due to exogenous causes, which could be considered arbitrarily eliminated (respiratory and infectious diseases).

Analysis of thecauses of infant mortality in urban and rural areas of West Siberia shows rather significant structural differences. Although there was prevalence in 1980 of respiratory, infectious diseases and perinatal pathology among causes of infant death in cities, by 1990 the structure of infant mortality began to correspond to the republic mean. In rural areas, the findings were different. In 1980, respiratory disease was very prominent among causes of rural infant death in the West Siberian region (47 to 57 percent), and in 1990 this class of causes was in one of the leading places (2d place in Kemerovo and Novosibirsk oblasts, 3d in Altay Kray and Omsk Oblast). The share of infectious diseases dropped in 10 years to 1/2-2/3. As was the case everywhere, the percentage of perinatal pathology rose in rural areas of West Siberia, and in 1990 this class of causes advanced to first place; however, as compared to urban areas, the share of rural perinatal pathology was not as great (29-38 percent in rural areas versus 38-53 percent in cities). Thus, in rural parts of West Siberia, respiratory diseases are still a rather serious problem.

The mortality rate for children up to 14 years of age is also higher in our country than in other economically developed nations [22].

In the structure of child mortality (up to 14 years) in the Russian Federation, congenital developmental defects are in one of the first places, and their incidence has increased appreciably in recent years, constituting 28.3/1000. In essence, this refers to defects of the musculoskeletal system (27 percent), gastrointestinal tract (17.5 percent) and cardiovascular system (17.5 percent). Analysis of postmortem findings data revealed that, on the whole, the incidence of congenital defects in children up to 14 years old constitutes 25.8 percent. This is considerably higher than in the population, and it is indicative of the extremely important role of congenital defects in thanatogenesis [17].

One of the most pressing pediatric problems is pathology of the CNS [central nervous system]. In 1989, there were more than 300,000 children with organic CNS pathology, including 122,000 with infantile cerebral paralysis, who were under dispensary supervision in medical institutions of the former USSR. In the last 10 years, the number of children with such pathology tripled. At the present time, the incidence of organic diseases of the nervous system among children up to 14 years old constitutes 30.6/1000. In their structure, 36 percent refers to pre- and perinatal encephalopathy, 24 percent to infantile cerebral paralysis, 19 percent to the convulsion syndrome, 10 percent to neuroinfection, 9 percent to sequelae of birth trauma, and 2 percent to hereditary diseases [11].

In the first 3 years of life, perinatal CNS lesions constitute about 70 percent of all neurological pathology and in older children, about 50 percent. Asphyxia and birth trauma are the most frequent causes of neurological disease. In the overall structure of postnatal pathology, the share of which increases from 3 percent in the first year to 56 percent in children of school age, most (39 percent) consists of borderline diseases (neurasthenic syndrome, enuresis) [11].

According to data of the Novosibirsk Oblast Health Department, in 1990 the incidence of mental illness per 1000 child population constituted 26 cases, there being 1.7 cases of infantile cerebral paralysis and 2 of epilepsy.

Respiratory disease is among the most frequent causes of childhood morbidity and mortality. It constitutes 77 percent of all pathology encountered in infants 1 to 3 years old. In children attending preschool institutions respiratory disease is recorded 3 times more often. This refers primarily to acute viral respiratory infections, nasopharyngitis, influenza, bronchitis and sore throat [8].

In the Russian Federation the incidence of chronic pneumonia among children up to 14 years old constitutes 0.5-0.9/1000 and bronchial asthma, 4-9/1000. At the same time, according to N. A. Bogdanov et al. [5], the incidence of chronic nonspecific lung diseases in children of rural areas is 8-9 percent, while the threat of their development applies to 24.5 percent of the children. In 1990, the incidence of chronic pneumonia constituted 4, chronic bronchitis 2, and bronchial asthma 3 cases per 1000 child population of Novosibirsk oblast.

Cardiovascular diseases are among the key pediatric problems. Their incidence per 100,000 child population of Russia is as follows: 342 for congenital heart defects, 40 for primary rheumatic disease, 140 for recurrent rheumatism, 20-30 for rhythm disturbances, 30 for various forms of arthritis, 10-20 for myocarditis, and 5-14 for hypertensive states [4]. In recent years, hypotensive states began to be noted in adolescents more often than hypertensive ones. Arterial pressure was 90/40 mm Hg or lower in every fifth adolescent [14].

An All-Union study of precursors of atherosclerosis in children and adolescents, which was carried out in the mid-1980s, revealed that 80 percent of school-age children had some risk factor or other for development of cardiovascular disease. The incidence of such risk factors among Novosibirsk schoolchildren was as follows: hypodynamia 64 percent, dyslipoproteinemia 41 percent, obesity 16

percent, smoking 8 percent, arterial hypertension 6 percent [20]. A recheck of the same children 5 years later revealed that the situation had become even more serious: incidence of arterial hypertension rose to 11 percent (among young boys) and hypodynamia to 83 percent (among young girls); the incidence of obesity rose to 30 percent, and there was a significant rise in percentage of habitual smokers, to 50 among young boys and 26 among young girls [21].

In recent years, there has been a rise in number of children with digestive diseases of noninfectious etiology. While in 1975, 70-75 cases were recorded per 1000 child population of the Russian Federation, in 1989 there were already 100-110 [12]. In the structure of digestive diseases, pathology of the gastroduodenal zone is in 1st place (51-57 percent), diseases of bile ducts are in 2d (24-37 percent), and intestinal pathology in 3d (7-16 percent) [15].

Acute intestinal infections are recorded annually in 65-70 percent of the children [13]. In 51 percent of the cases their etiology is unknown, in 33 percent the diagnosis is shigellosis, in 12 percent enteritis of diverse etiology, in 3 percent typhoid fever and paratyphoid, and in 2 percent Yersinia infection. The age breakdown for acute intestinal infections is as follows: 58 percent 0-2 years, 25 percent 3-6 years, and 17 percent 7-14 years. The prime cause of the adverse situation with regard to acute intestinal infections in Russia is related, first of all, to the unsatisfactory condition of water supply and quality of drinking water. In children, intestinal infections are often related to consumption of tainted food, particularly dairy products [13].

Among children over 1 year old, mortality due to malignant pathology is in 2 place, after accidents. In the structure of causes of death due to malignant pathology, lymphatic and hemopoietic tissue tumors are in 1st place (53 percent) among children, other nosological forms (bone, connective tissue and urinary tract organ tumors 5 percent, digestive organ tumors 4 percent, tumors of the buccal cavity and throat 1.3 percent) are encountered much less often [1].

The incidence of diseases of the urinary system among the child population of the Russian Federation constitutes 3/1000 [7]. There is prevalence of bacterial and inflammatory processes. Infection of the urinary tract is encountered in 33 percent of the cases, and various forms of pyelonephritis in 48 percent. Glomerulonephritis is encountered in 8 percent of the children with diseases of the urinary system; congenital and hereditary nephropathy, in 7 percent. There are distinctive features in urinary system pathology among children residing in different parts of Russia. For example, there is prevalence of a distinctive renal syndrome following hemorrhagic fever in the Far East, and latent nephropathy in the region of the Baykal-Amur highway [7]. In 1990, the incidence of urinary

system pathology per 1000 child population of Novosibirsk Oblast constituted 1.8 cases.

Diabetes mellitus is not often encountered in childhood, but there are always clinical manifestations. In 1988, the incidence of this pathology per 100,000 child population of the Russian Federation constituted 32.7 cases, and new cases of diabetes 6.3. There are considerable regional differences in incidence of this disease among children. Its incidence is high among the child population of Moscow and St. Petersburg (45-54 cases per 100,000 children), and low in Tyumen Oblast (12.4 cases) [10]. This indicator is close to the mean for Russia (30.0) in Novosibirsk Oblast.

The indicators of health status of the child population depend largely on condition of the environment. In ecologically adverse regions, childhood morbidity is 1.5-2 times higher than in other regions. There is a higher risk of development of congenital defects, perinatal pathology, the nervous and endocrine systems are strongly affected: earlier puberty and taller height are noted among children living near chemical enterprises [22].

In regions where aluminum plants are located, the incidence of diseases of the nervous and urinary systems is 2-3 times higher than the statistical mean. In Altay Kray, hemolytic anemia of a chemical nature is noted in more than 100 neonates. In Angarsk, there was a higher incidence of bronchial asthma and bronchitis among children, as a result of exposure to waste from a local protein and vitamin concentrate plant. In regions exposed to radiation following the disaster at the Chernobyl Nuclear Power Plant, there was a change in course of diseases, a tendency toward longer and more severe course of bronchopulmonary and renal diseases [3].

Russian physicians are quite alarmed by the health status of schoolchildren: 53

of the children of school age are in poor health and 58 percent had restrictions for health reasons in choosing an occupation after graduation. There is a distinct tendency toward rise in incidence of obesity, myopia, mental disorders, flat foot, and allergic diseases. More than 33 percent of the schoolchildren have some sort of chronic disease, most often of digestive organs, nasopharynx, and allergies. The number of schoolchildren in good health does not exceed 25-30 percent. Over the period of their schooling, the number of healthy children drops to 1/4-1/5 [18].

Thus, all of the foregoing is indicative of the serious situation with regard to physical condition of children in Russia, due not only to the economic crisis, social upheavals and ecological disturbances. It is imperative to radically alter the entire system of mother and child care, devoting special attention to family medicine and prevention, increasing by many times the financing of pediatric hospitals and schools, since all expenses would result in health of the nation.

References

1. Aksel, Yu. M., and Dvoyrina, I. V., PEDIATRIYA, 1988, No. 4, pp 71-74.

2. Baranov, A. A., Ibid, 1990, No. 7, pp 5-10.

3. Baranov, A. A., and Tsymlyakova, L. M., Ibid, 1991, No. 2, pp 5-7.

4. Belokon, N. A., Zelinskaya, D. I., Osokina, G. G., and Sipyagina, A. Ye., VOPR. OKHR. MAT., 1989, No. 7, pp 3-6.

5. Bogdanov, N. A., Tsyura, I. G., Tyshetskiy, V. I., and Zhernosekov, I. I., ZDRAVOOKHR. ROS. FEDERATSII, 1989, No. 8, pp 15-18.

6. "Demograficheskiy yezhegodnik SSSR, 1990 god" [USSR Demographic Annual], Moscow, 1990.

7. Ignatova, M. S., and Veltishchev, Yu. Ye., "Detskaya nefrologiya" [Pediatric Nephrology], Moscow, 1982, pp 7-18.

8. Ignatyeva, R. K., Yurlova, I. A., Ogryzko, Ye. V., and Tyminskiy, G. V., VOPR. OKHR. MAT., 1990, No. 10, pp 46-50.

9. Kaganov, S. Yu., Zelinskaya, D. I., Baleva, L. S., and Pankova, G. F., Ibid, 1991, No. 4, pp 5-8.

10. Knyazev, Yu. A., PEDIATRIYA, 1991. No. 2, pp 7-10.

11. Leshkevich, I. A., Sarycheva, S. Ya., and Morozova, V. I., Ibid, No. 4, pp 5-9.

12. Mazurin, A. V., Zaprudnov, A. M., and Tsvetkova, L. N., Ibid, 1989, No. 4, pp 66-69.

13. Morunova, A. A., Ibid, 1990, No. 9, pp 5-8.

14. Nadezhdina, Ye. A., Ibid, No. 8, pp 5-8.

15. Novis, A. V., and Sokolova, M. I., ZDRAVOOKHR. ROS. FEDERATSII, 1991, No. 3, pp 10-12.

16. Petrov, P. P., and Borokhov, D. Z., SOV. ZDRAVOOKHR., 1991, No. 3, pp 34-38.

17. Reznik, B. Ya., and Minkov, I. P., Ibid, 1990, No. 1, pp 41-43.

18. Sarycheva, S. Ya., PEDIATRIYA, 1990, No. 8, pp 79-85.

19. Sikstus Sherif A., Egbagbe, SOV. ZDRAVOOKHR., 1989, No. 7, pp 51-55.

20. Feyzukhanova (Denisova), D. V., "Risk Factors for Atherosclerosis and Ischemic Heart Disease in Children and Adolescents 10-14 Years Old," author abstract of candidatorial dissertation in medical sciences, Moscow, 1988.

21. Idem, "Tikhookeanskiy kongress kardiologov, 10-y: Tezisy dokladov" [10th Pacific Congress of Cardiologists: Summaries of Papers], Seoul, 1991.

22. Shchepin, O. P., VOPR. OKHR. MAT., 1990, No. 2, pp 3-7.

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Revision of Health Insurance Law

Law on Amendments of the RSFSR Law on Public Health Insurance

[Law No.4741-1 of the Russian Federation On Amendments of the RSFSR law "On Public Health Insurance in the RSFSR," signed by B. Yeltsin, president of the Russian Federation, on 2 Apr 93]

[Text]

Article 1. Make the following amendments to the RSFSR law "On Public Health Insurance in the RSFSR" (VEDOMOSTI SYEZDA NARODNYKH DEPUTATOV RSFSR I VERKHOVNOGO SOVETA RSFSR, 1991, No.27, p 920):

1. In the title and text of the "On Public Health Insurance in the RSFSR," replace "RSFSR" with "Russian Federation," in text of articles replace "krays, oblasts, autonomous okrugs and autonomous oblasts" with "autonomous oblasts, autonomous okrugs, krays, oblasts, cities of Moscow and St. Petersburg."

2. Use the following wording in the fourth part of Article 1:

   "Mandatory health insurance is a component of State health insurance and provides all citizens of the Russian Federation with equal opportunity to receive medical care and drugs funded by resources of mandatory health insurance in the volume and on conditions conforming to programs of mandatory health insurance."

3. In the title and text of Article 3, add "voluntary" after the words "object" and "by object."

4. In the third part of Article 5, replace "Union republics" with "States."

5. In the first part of Article 6, delete "free."

6. In the title and text of Article 7, delete "of citizens of other Union republics " and "citizens of other Union republics and," respectively.

7. In the second part of Article 9, delete the second paragraph.

8. In Article 10:—delete "Union of the USSR" in the last paragraph of the first part;—use the following wording for the second part: "The financial resources of the State and municipal health care systems and financial resources of the State system of mandatory health insurance are formed from these sources";

9. In Article 11:—use the following wording for the title of the Article: "Financial resources of the State and municipal health care systems";—use the following wording for the first part: "The financial resources of the State and municipal health care systems are earmarked for implementation of State policy in the field of public health care. The Russian Federation Government, governments of republics in the Russian Federation, State administrative agencies of autonomous oblasts, autonomous okrugs, krays, oblasts, cities of Moscow and St. Petersburg, local administrations determine the extent of funding of the State and

municipal health care systems.";—delete the second part;—use the following wording for the first paragraph of the third part: "Financial resources of the State and municipal health care systems are used for:";—in the first sentence of the fourth part, delete "health care funds," and delete the second sentence.

10. Use the following wording for Article 12:

Article 12. Financial resources of the State system of mandatory health insurance

"The financial resources of the State system of mandatory health insurance are formed by deductions of insurants for mandatory health insurance." " Federal and territorial mandatory health insurance funds are established as independent nonprofit finance and credit institutions to implement State policy in the field of mandatory health insurance."

"The federal mandatory health insurance fund is established by the Supreme Soviet of the Russian Federation and Russian Federation Government and it operates in accordance with legislation of the Russian Federation."

"Territorial mandatory health insurance funds are established by the supreme soviets of republics of the Russian Federation and governments of republics of the Russian Federation, councils of people's deputies of autonomous oblasts, autonomous okrugs, krays, oblasts, cities of Moscow and St. Petersburg and relevant executive agencies, and they operate in accordance with legislation of the Russian Federation and republics of the Russian Federation, enforceable enactments of autonomous oblasts, autonomous okrugs, krays, oblasts, cities of Moscow and St. Petersburg."

"Mandatory health insurance funds are designed to accumulate financial resources for mandatory health insurance, provide financial stability of the State mandatory health insurance system and equalize the financial resources for its implementation."

"The financial resources of mandatory health insurance funds are the State property of the Russian Federation, they are not included in budgets or other funds, and they cannot be withdrawn."

"The procedure for collecting insurance premiums for mandatory health care is elaborated by the government of the Russian Federation and approved by the Supreme Soviet of the Russian Federation."

11. In Article 13:—in the first part, replace "into health care funds" with "to fund the State and municipal health care systems."—add a third part to this article reading as follows: "Federal and territorial mandatory health insurance funds are exempt from income taxes pertaining to basic occupation."

12. In the second part of Article 15, add the following secondparagraph: "to perform work dealing with mandatory health insurance on a nonprofit basis;"

13. In Article 16, replace "by the RSFSR Ministry of Finance and its agencies" with "agencies of the Russian federal service for oversight of insurance activities."

14. In article 17:—in the second part, replace "Insurance premiums" with "Payments ;—use the following wording for the fourth part: "The rate of insurance premiums for mandatory health insurance for enterprises, organizations, institutions and other business entities, regardless of forms of ownership, is set at a percentage of credited wages on all bases, and is approved by the Supreme Soviet of the Russian Federation.";—delete the fifth part;—add a seventh part to the article reading as follows: "Social organizations for the disabled, enterprises, associations and institutions that are the property of said organizations, which were set up to implement their charter purposes, are exempt from paying premiums for mandatory health insurance."

15. In the first part of Article 23, delete "between the health insurance organization and medical institution."

16. Use the following wording for the first part of Article 27:

"Financial sanctions are applied to enterprises, institutions, organizations and other business entities, regardless of forms of ownership, for refusing to register as payers of insurance premiums; for concealing or underestimating the sums from which insurance premiums should be withheld; for being delinquent in payments thereof. Payment of fines and/or default interest does not release the insurant from health insurance obligations. Federal and territorial mandatory health care funds apply the rules set by Russian Federation tax agencies for collecting delinquent taxes in order to implement mandatory collection of fines and/or default interest."

Decree on Reexamination of RF law on Amendments to RSFSR Law on Public Health Insurance in the RSFSR

[Decree No.4742-1 of the Supreme Soviet of the Russian Federation on] Reexamination of Russian Federation Law "On Amendments to the Law 'On Public Health Insurance in the RSFSR,'" signed by R. I. Khasbulatov, chairman of the RF Supreme Soviet, on 2 April 1993]

[Text]Whereby it has reexamined the Russian Federation Law "On Amendments to the RSFSR Law "On Public Health Insurance in the RSFSR"," returned by the president of the Russian Federation, the Supreme Soviet of the Russian Federation hereby decrees:

To adopt the Russian Federation law "On Amendments to the RSFSR Law ""On Public Health Insurance in the RSFSR','" with consideration of the suggestions of the president of the Russian Federation.

Decree on Procedure to Put Into Effect the RF Law on Amendments to the RSFSR Law on Health Insurance

937C0388C Moscow FEDERATSIYA in Russian No. 48, 29 Apr 93 p 6

[Decree No.4743-1 of the Supreme Soviet of the Russian Federation on Procedure to Put Into Effect the Russian Federation Law "On Amendments to the RSFSR Law"" On Public Health Insurance in the RSFSR"," signed by R. I. Khasbulatov, chairman of the RF Supreme Soviet, on 2 April 1993]

[Text] The Supreme Soviet of the Russian Federation hereby decrees:

1. To make the Russian Federation Law "On Amendments to the RSFSR Law" "On Public Health Insurance in the RSFSR" effective as of the day of its publication.

2. The Russian Federation Government will:—bring the existing enforceable enactments dealing with public health insurance into line with the said Law and implement their execution before 15 April 1993;—implement revision and abolition by ministries and agencies of the Russian Federation of enforceable enactments they previously passed that are in contradiction with the said Law before 25 April 1993.

Measures for Implementation of Russian Federation Law on Health Insurance Citizens in the RF

937C0411B Moscow VRACH in Russian No. 2, Feb 93 pp 5-7

[Order No.93 of the RF Ministry of Health: On Measures for Implementation of the Russian Federation Law "On Health Insurance of Citizens in the RF," dated 20 March 1992]

[Text] Appendix 3 **Standard Contract**

for providing medical and preventive care (medical services) through mandatory (voluntary) health insurance city: 50 19 3 Health insurance organization 40 50 (name) hereafter referred to as "Insurer" which has license No 20 dated 20 19 3 issued to 40 30 (name of agency) in the person of 40 20 (position, surname, name, patronymic) acting on the basis of the Charter, on the one hand, and medical institution 20 40 (name) hereafter referred to as "Institution," which has license No 20 dated 20 19 3 issued by 60 25 (name of commission that issued license) 60 and certificate No 20 dated 2 01 93 issued by 60 25 (name of agency that issued certificate) in the person of 40 20 (position, surname, name, patronymic) acting on the basis of 45 on the other hand, have concluded the present contract concerning the following:

1. Subject of Contract

1.1. The insurer assigns and the Institute assumes the obligation to render medical and preventive care to citizens to whom the Insurer has issued an insurance policy with assignment to an Institution. Said citizens are hereafter referred to as "insured group." The Institution renders medical-preventive care to other citizens as well, upon referral by the Insurer.

Such citizens enjoy the rights of the insured group to the extent indicated in the referral.

2. Scope and Quality of Medical and Preventive Care

2.1. The Institution must provide consistency of medical-preventive care to established professional standards.

2.2. The Institution renders medical-preventive care to the insured group, the types, scope and time of which are established by a list agreed upon by the parties, which is an inseparable part of this contract (with mandatory health insurance, this list must conform to the territorial program of mandatory health insurance).

2.3. If it is impossible for an Institution to render medical- preventive care of an established type, scope, time and/or standard, it must, at its own expense, provide such care for the insured group in another medical institution or by calling in an appropriate specialist.

The Institution must immediately inform the Insurer when it is impossible for it to render medical-preventive care of an established type, scope and/or standard.

Consent of the insured citizen and Insurer (with the exception of urgent medical care) must be obtained for medical-preventive care in another medical-preventive care institution chosen by the Institution.

2.4. The Institution must inform the Insurer about arising circumstances that could lead, within the immediate future, to violation of requirements of professional standards, reduction in type, scope and change in time of rendering medical-preventive care.

2.5. If it is impossible for the Institution to meet requirements in items 2.1 and 2.2. of this contract, the Insurer has the right, at its discretion, to transfer insured citizens to another medical institution for medical-preventive care, or to call in an appropriate specialist to administer medical-preventive care to the insured group at the Institution.

3. Number of Insured People

3.1. The insured group consists of 10 people. The Insurer has the right to alter this number by no more than 10 percent without the consent of the Institution.

3.2. The Insurer must submit to the Institution a list of the insured group with indication of data agreed upon by the parties within 10 days after this contract becomes effective.

3.3. The Insurer informs the Institution immediately about all changes in number [of people] in the insured group.

4. Cost of Services and Procedure for Settling Accounts

4.1. The Insurer pays for the medical-preventive care rendered by the Institution to the insured group at rates approved, following procedure established by the RSFSR Law "On Health Insurance of Citizens in the RSFSR."

4.2. Accounts are settled monthly by the Insurer by paying the Institution's claims within 5 days. When this term has elapsed, the funds are written off the account by the bank.

4.3. Accounts pertaining to payment of medical-preventive services rendered to the insured group are checked by the parties within the 5th day of the month following the reporting quarter. A final check of the accounts is made no later than 5 January of the year following the reporting one.

The Institution submits to the Insurer all necessary accounting documentation.

4.4. The tentative amount covered by this contract is 20 rubles. This sum may change if there is a change in rates for medical services.

4.5. The Insurer transfers to the Institution an advance of 20 rubles within 5 days after this contract becomes effective.

5. Procedure for Rendering Medical-Preventive Care

5.1. The Institution renders medical-preventive care to the insured group in accordance with the work schedule coordinated with the Insurer.

6. Record-Keeping at Medical Institution

6.1. The Institution must keep records of:—the insured group;—type, volume and time of rendering medical-preventive care to the insured group;—funds received from the Insurer.

Organization of accounting is coordinated with the Insurer.

7. Monitoring

7.1. The Insurer verifies consistency of medical-preventive care rendered with professional standards and this contract.

7.2. Monitoring is implemented by means of inspections carried out by a representative of the Insurer. Inspections are carried out as needed. The Insurer informs the Institution of the results of inspections.

7.3. If the Institution disagrees with the findings of the Insurer's representative, it has the right to turn to the territorial accreditation commission, within 5 days for settlement of the dispute. The commissions findings are mandatory for the parties.

7.4. The Institution must give free access to the Insurer's representative who is carrying out the inspection to activities of the Institution related to fulfillment of this contract.

8. Responsibility of the Parties

8.1. The Insurer remits a fine equaling 20 percent per day of the overdue amount in case of late payments stipulated in this contract. Payment of the fine does not exempt the Insurer from the basic payment. If the Insurer's payment is no more than 5 days overdue, the Institution must continue to render medical-preventive care to the insured group (applies to mandatory health insurance).

8.2. For failure to meet the due date indicated in Item 3.2 of this contract, the Insurer pays the Institution a forfeit in the sum of 10 .

8.3. For failure to meet the requirements in Item 7.4 of this contract, the Institution pays a penalty to the Insurer in the sum of 20.

8.4. For failure to meet the requirements in Item 6.1 of this contract, the Institution pays the Insurer a penalty in the sum of 20.

8.5. In addition to the sanctions indicated in items 8.3 and 8.4, if the Institution violates the conditions of this contract the Insurer has the right to withhold part or all of the reimbursement to the Institution for expenses in rendering medical-preventive care.

8.6. In the event one of the parties divulges information that is a trade secret of the second party, provided that such information was known to be such a secret, the guilty party must compensate the second party for loss sustained in this connection.

9. Responsibility-Releasing Circumstances

9.1. The parties are released from responsibility for partial or complete failure to perform their duties according to this contract, if such failure to perform was due to a major force (fire, flood, earthquake, other natural phenomena, as well as war, strikes and other circumstances at the discretion of the parties) arising after this contract was concluded.

9.2. If circumstances indicated in Item 9.1 occur, the party affected by such circumstances must immediately inform the second party.

Existence of a major force must be subsequently confirmed by 10   70 (name of agency or organization)

10. Notification and Reporting

10.1. All notifications and reports of the parties related to fulfillment of this contract must be made in writing.

10.2. The parties are obligated to inform one another immediately of any change in their addresses and description.

11. Amendment and Cancellation of Contract

11.1. This contract can be amended only with the written consent of the parties.

11.2. This contract may be canceled before it expires: a) with the written consent of the parties; b) at the instigation of one party, provided the second party is notified in writing no later than   20 prior to expiration date of the contract.

12. Term of Contract

12.1. This contract becomes effective on the date it is signed by the parties and remains effective for 20.

13. Other Conditions

14. Parties are governed by Russian legislation on matters not covered in this contract.

15. Addresses and Description of Parties

15.1. Insurer 50

15.2. Institution 50

Signatures:

Appendix 5

Guaranteed List

of types of medical care (basic program) funded by budgets allocated for health care

1. Primary medical care, including: 1.1. Urgent medical care of the public in case of:—sudden illness and life-threatening states;—accidents, poisoning and trauma;—parturition;—severe and acute diseases. 1.2. Outpatient treatment, including care by other than physicians, of:—acute and exacerbated chronic diseases;—trauma and accidents. 1.3. Diagnosis and treatment at the home of patients who cannot visit a medical institution because of their condition and nature of illness. 1.4. Implementation of disease-prevention measures:—organization and administration of preventive inoculations to children, adolescents and the adult unemployed population;—clinical supervision, dynamic observation and implementation of scheduled medical sanitary and preventive measures for: 3—children 0 to 14 years old, including logoneurosis cases; 3—adolescents 15 to 18 years old, including logoneurosis cases; 3—pupils and students attending educational institutions; 3—the disabled, pensioners, veterans of the Great Patriotic War and individuals equated to them, participants of the war in Afghanistan;—insertion of intrauterine devices and prescription of hormonal contraceptives;—clinical supervision of patients with tuberculosis, endocrine and oncological diseases, those with history of myocardial infarction, acute cerebrocirculatory disorder, those with chronic renal insufficiency, mental and other diseases of danger to society. 1.5. Stomatological aid for:—individuals up to 18 years, pupils and students attending an educational establishment, the disabled, pensioners, pregnant women, women with children up to 3 years (full scope);—emergency stomatological care of patients;—gingivitis, diseases of the oral mucosa;—neoplasms of the maxillofacial region. 1.6. Drug supply in accordance with the list of diseases and states, in the presence of which there are preferential terms for drugs by decision of State administrative agencies.

2. Hospital Care for:—patients with acute diseases and exacerbation of chronic ones, trauma, burns, poisoning, which present an immediate threat to the patient's life or others;—infectious and oncological patients;—obstetric patients;—abortions on medical and social indications. 3. All types of first aid, as well as hospital care of patients with acute diseases and trauma are rendered to all individuals, regardless of place of residence and registration, are funded by the budget of territories where the above-listed types of aid are given.

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NPO Donates Novel Disinfection Equipment to Public Institutions

[Article by Gherman Lomanov; first paragraph MOSCOW NEWS comment]

[Text] The sanitary and epidemiological condition in the institutions of public health, trade and public catering is now open to criticism, and in some places simply catastrophic.

The scientific-production association engaged in interplanetary flights realizing the need to urgently mend the situation and assess soberly its prospects in the market of medical equipment, has started the production of equipment for disinfection.

The equipment enjoys success but, according to Marina Polyakova, head of the marketing department of the Kront company set up by the scientific-production association, because of money shortage many medical institutions cannot afford such equipment. Therefore, the newly-fledged businessmen decided to simply give them several of the new instruments. For instance, the International Mother-and-Child Care Fund and the St. Petersburg Children's Home received EKO installations for preparing disinfectant solutions and plastic boxes for the treatment of medical instruments.

The value of the gifts (about 2.5 million roubles) is not so high according to the present standards, but the precedent is important: among sponsors is the world-famous, but no longer wealthy space company which actually does not get allocations from the budget for its conversion and itself experiences serious financial difficulties.

Innovations in Equipment for Roentgenology

[Article by E. G. Chikirdin, Moscow Research Institute of Diagnostics and Surgery, Russian Ministry of Health, under the rubric: "Help for Medical Practitioners"]

[Text]In 1992, seven items of x-ray equipment underwent clinical trials and were recommended by the Russian Federation Ministry of Health for series production. First of all, we should mention the Obraz-2 [Image] magnetic resonance tomograph (developed and manufactured by the Agregat AO [Joint Stock Company], Moscow), which will replace the preceding model, Obraz-1 that was produced in series. The tomograph has a 0.14 T resistance magnet (instead of 0.12 T as in Obraz-1), which produces an image with higher resolution. At the same time, the cost of the product has also risen (from 18 to 27 million rubles).

A phantom kit (from the Ekran [Screen] NPO [Research-Production Association]) has been developed and is being manufactured for monitoring and adjusting the magnetic resonance tomographs.

The x-ray diagnostic unit, Rentgen-47 (Sevkavrentgen plant, Kabardino-Balkariya), which has a 3-phase, 6-pulse, 125 kV, 800 mA power pack, and two interchangeable No.1 and No.3 cradles, which are ordered by the user, is designed to examine children. The unit is equipped with a turntable and film holder, which are the same as in the Rentgen-40 series of units.

Kruiz, a flat x-ray image amplifier, has been developed (Special Design and Technological Office for Medical X-ray Equipment, an affiliate of the Mosrentgen AO) to obtain 150-fold enhancement of screen brightness. However, its contrast index is not high enough (0.8 versus the desirable value of 0.9), which makes it necessary to work in a darkened room.

The ARS-2 film-taking x-ray unit (Mosrentgen AO) has a 3-phase, 6-pulse, 125 kV, 800 MA power pack with micro-processor control (Reneks 50-6-2 power pack). It is equipped with a refined film table with a Storens tomog-raphy attachment and Stors film holder. The unit has passed clinical trials at the Moscow Research Institute of Diagnostics and Surgery.

An improved quality of x-rays and tomograms is obtained with the kit for optimum x-ray filtration (Ekran NPO, Moscow), which consists of compensation wedges with different configurations that are transparent to visible light and placed at the end of the depth collimator.

The AIRM VR (Neftepromavtomatika [Oil Industry Auto-mation] NPO, Kazan), an automated interactive roentgen-ologist's work station, reduces time and enhances quality of roentgenological findings. It also puts out automatically the mean radiation dose to the patient over the examina-tion time, and records the number and format of films.

There are many other developments that are close to completion, about which we will make an additional report.

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Reproductive Complications in Men Engaged in Chernobyl Cleanup

[Article by V.V. Yevdokimov, V.I. Yerasova, A.I. Demin, Ye.B. Dubinina and P.N. Lyubchenko, Institute of Urology, Ministry of Health, Russian Federation; Moscow Oblast Clinical Research Institute imeni M.F. Vladimir-skii, Moscow]

[Abstract] Reproductive follow-up studies were conducted on 164 men that had been engaged in cleanup efforts at the
Chernobyl nuclear power plant. External exposure levels of these 22-50 year old men were reported not to have exceeded 25 cGy. The protocols involved questionnaires and, in the case of 125 of the men, laboratory examina-tions of semen samples. The findings indicated that one third of the men suffered from various degrees of impo-tence. In addition, 21% presented with chronic prostatove-siculitis, azoospermia, oligozoospermia, or asthenosper-mia. Thus, impotence and infertility should also be included on the list of medical complications that are being monitored in the the Chernobyl cleanup personnel. Tables 1; references: 2 (Russian).

PHARMACOLOGY AND PHYSIOLOGY

Assessment of Fungus Resistance of Microassemblies

[Article by T. N. Pavlovich, E. Z. Koval, and L. P. Sidorenko, Lvov Research Institute of Materials, Center for Innovations, Ukrainian Academy of Sciences, and Institute of Microbiology and Virology, Ukrainian Academy of Sciences, Kiev, under the rubric "Physiology and Biochemistry of Fungi"; UDC 620.193.8:582.288; 5 graphics unavailable]

[Text]In spite of the expanded production of microassem-blies that find application in the manufacture of electronic equipment, a complete description of their reliability under various ecological conditions has not yet been compiled. One of its indicators is resistance to fungi, which can be examined in direct relationship to properties of a material and their changes under the effect of various factors, including extreme ones (Astafyev, 1966; Flerov, 1972; Gerasimenko, 1984; Lugauskas et al., 1987). There are virtually no data on fungus resistance of thin- and thick-film elements of microassemblies used extensively in electronics (Blagnik, Zanova, 1965; Andreyuk et al., 1980; Gerasimenko, 1984; Kanevskaya, 1984; Zaikina, Yelinov, 1985; Koval, Sidorenko, 1989). Yet the structure of assembly materials and data on low fungus resistance of some of them warrant the assumption that microassem-blies are vulnerable to fungi, particularly when used in regions with high humidity, as well as in tropical and subtropical climates.

This article deals with a discussion of the results of studying fungus resistance of thin- and thick-film elements of microassemblies under model conditions.

We tested fungus resistance of microassemblies consisting of thick-film elements based on various pastes—resistance, condenser, conductor, dielectric insulation and condenser, as well as thin-film elements based on resistance and dielectric alloys listed in the table.

Fungus-resistance characteristics of tested specimens

Name of microassembly specimens	Rating of fungus resistance, score	Lag phase, days	Maximum growth estimate, days	Viability of conidia, months	Condensate rating	Isolated fungus species
Thick-film elements based on paste						
Resistance 8000	0	—	—	—	1	—
Resistance 4004	0/3	10	25	3	3	*Aspergillus niger, Trichoderma viride*
Resistance 4005	0	—	—	1	1	—
Resistance 4006	0/3	5	15	5	2	*Aspergillus terreus*
Resistance 4007	0/4	15	25	2	2	*A. terreus, Penicillium funiculosum*
Resistance 4008	2	20	25	—	3	*A. niger*
Resistance 4009	0/3	10	20	3	2	*A. flavus, Penicillium chrysogenum*
Resistance 4010	0/4	10	25	2	2	*A. flavus*
Resistance 4011	1	25	30	—	2	*A. niger*
Resistance polymer 0630	0/5	5	15	2	2	*A. flavus Paecilomyces variotii*
Resistance polymer 0650	2/0	15	20	2	2	*A. flavus*
Resistance ruthenium 4400	3	5	10	—	3	*A. niger, Penicillium funiculosum*
Resistance ruthenium 4413	4/5	10/5	30/20	—	3	*A. flavus*
Resistance ruthenium 4451	4/5	15/10	30/25	—	3	*A. niger*
Resistance ruthenium 4461	4/5	15/5	30/20	—	3	*A. flavus + A. niger, Penicillium funiculosum*
Condenser 092	0	—	—	1	1	—
Conductor 3701	4/5	15/10	30/25	—	3	*A. niger*
Conductor 3711	1/4	20/10	25	—	3	*A. niger*
Dielectric insulation 8091	4/5	10/5	25/5	—	3	*Penicillium funiculosum*
Dielectric condenser 8021	4/5	20/10	30/25	—	3	*Paecilomyces variotii*
Thin-film elements based on alloys						
Resistance ST 3025	0	—	—	1	1	—
Resistance ST 3812	0	—	—	2	1	—
Dielectric DO 14-30	0/5	5	10	3	2	*A. flavus, Trichoderma viride*

Note: Assessment of fungus resistance: numerator—fungus resistance of microassemblies, denominator—resistance of underlayer. Viability of conidia: applied conidia showing no growth on specimens. Condensate rating: 1) few large drops that fall off readily; 2) numerous medium-sized drops, almost stationary; 3) small drops over the entire specimen, stationary.

The tests for fungus resistance were carried out in accordance with GOST 9.048...9.053-75 (with 1986 supplements). We used fungus strains isolated from specimens of analogous composition that had undergone field tests in different climate zones. Isolation, identification, determination of lag phase and viability of conidia of tested fungi were carried out by conventional techniques ("Methods of Experimental Mycology...", 1982). The tests were repeated 3-5 times. The findings were submitted to statistical processing. We assessed reliability of difference between experimental variants according to Student's criterion at 95 percent level of significance.

It was impossible to assess unequivocally the fungus resistance of the tested thin- and thick-film elements of microassemblies in all test variants; it differed and depended on a number of factors.

The principle of establishing the extent of growth of fungus colonies and giving it a score on the 30th day of the experiment served as the basis for determination of resistance of the materials to fungi (GOST 9.048...9.053-75). There is no special GOST [State standard] for microassemblies; however, the distinctions of fungal growth on them enable us to discuss the need to create one.

Microassemblies are a combined substrate consisting of variable ceramic or polymer materials in the form of an underlayer on which there are metal parts. The two elements of this substrate are not quite equal in accessibility to fungi due to the physicochemical properties of their surface. Evidently, this is what caused the differences in growth processes of micromycetes that were noted on the microassemblies.

Microassemblies are a specific substrate that does not contain the basic agents of mycodestruction essential to vital functions: carbon, nitrogen and available water. In this respect, metabolic processes of mycodestructive agents have not been sufficiently studied, which makes it difficult to analyze and assess their growth, and also delays development of protective measures. While in bacteria such substrates are interpreted as "nongrowth" elements and a detailed explanation of the possibility of functioning of different species on them is available, for fungi a classification of substrates according to this criterion has not been developed (Okorokov et al., 1974; Malashenko et all., 1982).

Investigation of the metabolism of mycodestructors requires new, modern approaches that permit deeper examination and explanation of the functional capacity of the fungal cell on substrates of anthropogenic origin that contain no organic matter but permit normal metabolism of heterotrophs (Forster, 1950; "The Life of Microbes....," 1981). This has become particularly urgent at the present time, when basically new data are appearing to explain the specific metabolism of mycodestructors similarly to what has been established for bacteria (Cascelton, 1976; Zonneveld, 1988). For the time being, however, it is not deemed possible to explain the growth of mycodestructors on microassemblies, and we must limit ourselves merely to stating the facts on fungus resistance.

In assessing fungus resistance of the tested microassemblies, we observed differences in fungal growth as a function of the structure of their components. Three types of mycodestruction can be distinguished: 1) both the underlayer and elements are sensitive to fungi, 2) only the underlayer is sensitive to fungi, 3) only elements are sensitive to fungi. Most fungus-sensitive microassemblies are characterized by fungal damage to both components. Fungus growth was observed only on the underlayer in elements based on dielectric material DO 14-30. In resistors based on polymer paste 0650, only the paste was subject to mycodestruction.

Of all the fungal cultures used to infect microassembly specimens, the following formed a film and sporulated normally: *Aspergillus flavus, A. niger, A. terreus, Paecilomyces variotii, Penicillium chrysogenum, P. funiculosum, Trichoderma viride.* Damage caused by only one fungal species was noted in 11 out of the 23 tested specimens, and incidence of fungi varied: *Aspergillus terreus* and *Paecilomyces variotii* developed only on one specimen; *Aspergillus flavus* on three, and *A. niger* on five. Combined damage by two fungal species was observed in five specimens, and by three species on one, but we were unable to detect any stable link in formation of these complexes. The most eurybiontic species also prevailed: *A. flavus* and *A. niger.* Multicomponent colonies did not differ either structurally or in sporulation time. Usually, *A. flavus* was the main background in the film, whereas *A. niger* was arranged in islets in its center. An analogous film structure was noted in variants with complexes of *A. flavus + Paecilomyces variotii, A. flavus + Penicillium funiculosum, A. niger + Trichoderma viride.* It is only in the variant of formation of a two-component film by the *A. terreus + Penicillium funiculosum* complex that their colonies were distinctly circumscribed with lumina of 1-2 mm between them,

which did not disappear with age. This finding can be interpreted as a manifestation of antagonism on a certain level, which is known for many mycodestructors (Andreyuk et al., 1980). It is much more difficult to interpret the vulnerability of microassemblies to 1-2 fungal species, since joint presence of a rather considerable number of species, between which syntrophic interactions are established, is more often observed when fungi grow on inaccessible substrates (Blagnik, Zanova, 1965; Koval, Sidorenko, 1989).

We were unable to establish any pattern whatsoever or to explain the selectivity of fungi in relation to the corresponding series of tested specimens. In spite of the fact that assessment fungal growth in terms of rating the underlayer and microassembly did not always coincide, they were stricken by the same species of fungi. However, it must be noted that the underlayer played the leading role in manifestation of fungal growth in all variants of the experiment. Even in those cases where assessment of fungal growth in points almost coincided for both microassembly components as, for example, specimens of resistance ruthenium pastes 4413, 4451, 4461, conductor 3701, dielectric insulation 8031 and dielectric condenser 8021, the difference between underlayer and elements with respect to time of colony formation and conidial viability was distinctly demonstrable. The lag phase was shorter for all tested fungal species on the underlayer, whereas maximum growth rating was observed at earlier stages.

A correlation between fungal growth rating and nature of condensate was observed in all specimens. This can be explained if we compare the hydrophobic properties of the underlayers used. In this instance, the textolite underlayer was highly hydrophobic. This was confirmed when we carried out tests following a somewhat altered protocol, as compared to GOST, according to which the tested microassembly specimens were kept in a desiccator for 24 h at 98-100 percent humidity and temperature of 15-18°, following by heating at 26-28°C. In all specimens, the condensate differed in droplet size, quantity and mobility: 1) a small number of large drops, over 1-1.5 mm in diameter, that rolled off readily; 2) numerous droplets 0.5-1 mm in diameter, virtually stationary; 3) numerous drops 0.1-0.3 mm in diameter, stationary. The nature of condensate distribution on the specimens was analogous to the nature of drop formation when the specimens were innoculated with conidial suspension. Since moisture is the main factor affecting fungal function, in this instance too it was easy to track the relationship of fungus resistance to formation of condensate and hydrophoby of the microassembly surface. In the case of high water repellence of the microassembly surface, the drops of condensate or applied conidial suspension were notable for larger size and high mobility, which prevents adhesion of fungal conidia and, consequently, does not permit their further growth. Fungus resistance of resistors based on polymer paste 0630 with a textolite underlayer indicates that use of hydrophobic underlayers can be one of the methods of producing microassemblies that are impervious to mycodestruction.

Distortion of working parameters of microassemblies was observed not only with growth of conidia and formation of fungal colonies, but also in the case of a considerable level

of contamination when the number of conidia exceeded $10^6/mm^2$. This can be attributed to the effect of metabolic products of conidia that are produced in trace amounts even when conidia were in an anabiotic state ("Biology of Conidial Fungi," 1981). The observed destructive processes differed, depending on structure of the underlayer and microcircuit, analogously to the experimental variants in which colonies were formed. Evidently, evaluation of resistance of microassemblies to fungi must be made with consideration of several criteria characterizing the physicochemical properties of the surface (hydrophoby, porosity, moisture condensation, electric charge, etc.), and the assessment should be expressed as a fraction, which would correspond to the fungus resistance of the underlayer and fungus resistance of the microcircuit.

Since the methods used to determine fungus resistance of microassemblies do not provide reliable estimate and do not permit prediction of reliability of using them under diverse ecological conditions, the need arises to develop new models that conform better to naturally occurring contamination and mycodestruction processes.

References

1. Andreyuk, Ye. I., Bilay, V. I., Koval, E. Z., and Kozlova, I. A., "Mikrobnaya korroziya i yeye vozbuditeli" [Microbial Corrosion and Its Pathogens], Kiev, Nauk. dumka, 1980, 260 pages.

2. Astafyev, A. V., "Okruzhayushchaya sreda i nadezhnost radioelektronnoy apparatury" [The Environment and Reliability of Electronic Equipment], Moscow, Energiya, 1966, 40 pages.

3. Bekker, Z. E., "Fiziologiya i biokhimiya gribov" [Physiology and Biochemistry of Fungi], Moscow, Izd-vo MGU [Moscow State University], 1988, 230 pages.

4. Blagnik, R., and Zanova, V., "Mikrobiologicheskaya korroziya" [Microbiological Corrosion], Moscow, Khimiya, 1965, 220 pages.

5. Gerasimenko, A. A., "Zashchita mashin ot biopovrezhdeniya" [Protection of Machinery Against Biological Damage], Moscow, Mashinostroyenye [Machine-Building], 1984, 112 pages.

6. GOST 9.048...9.053-75 (with 1986 supplements), "Izdeliya tekhnicheskiye. Metody ispytaniy na ustoychivost k vozdeystviyu plesnevykh gribov" [Technical Products. Methods of Testing Resistance to Mold Fungi], adopted 11 May 1975.

7. Zhdanova, N. N., and Vasilevskaya, A. I., "Eksperimentalnaya ekologiya gribov v prirode i eksperimente" [Experimental Ecology of Fungi in the Environment and Experiments], Kiev, Nauk. dumka, 1982, 168 pages.

8. Kashner, D., ed., "Life of Microbes in Extreme Conditions," Moscow, Mir, 1981, 600 pages.

9. Zaikina, N. A., and Yelinov, N. P., "Damage to Microassembly Materials," OBMEN OPYTOM V RADIOPROMYSHLENNOSTI, 1985, No. 11, p 55

10. Materialov [Biological Damage to Industrial Materials], Leningrad, Nauka, 1984, 230 pages.

11. Koval, E. Z., and Sidorenko, L. P., "Mikodestruktory promyshlennykh materialov" [Mycodestructors of Industrial Materials], Kiev, Nauk. dumka, 1989, 192 pages.

12 Lugauskas, A. Yu., Mikulskene, A. I., and Shlyauzhene, D. Yu., "Katalog mikromitsetov-biodestruktorov polymernykh materialov" [Catalogue of Micromycetes, Biodestructors of Polymers], Moscow, Nauka, 1987, 340 pages.

13. Malashenko, Yu. R., Sokolov, I. G., and Romanovskaya, V. A., "Mikrobnyy metabolizm nerostovykh substratov" [Microbial Metabolism of Nongrowth Substrates], Kiev, Nauk. dumka, 1982, 192 pages.

14. Bilay, V. I., ed., "Metody eksperimentalnoy mikologii. Spravochnik" [Guide: Methods of Experimental Mycology], Kiev, Nauk. dumka, 1982, 538 pages.

15. Okorokov, L. A., Lichko, L. P., Kadomtseva, V. M., et al., "Metabolism and Physicochemical State of Ions in Fungi," MIKROBIOLOGIYA, 1974, Vol. 18, No.3, pp 342-347.

16. Flerov, B. K., "Biological Damage to Industrial Materials and Goods Made With Them," "Problemy biologicheskikh povrezhdeniy i obrastaniy" [Problems of Biological Damage and Overgrowth], Moscow, Nauka, 1972, pp 3-8.

17. Forster, D., "Chemical Activity of Fungi," Moscow, IL [Foreign Literature Press], 1950, 650 pages.

18. Cole, G. T., and Kendric, B., eds., "Biology of Conidial Fungi," New York, Acad. Press, 1981, Vol. 2, 560 pages.

19. Cascelton, P. J., "Anapleurotic Pathways," "The Filamentous Fungi. V. Biosynthesis and Metabolism," J. E. Smith, D. E. Berry, eds., London, Edw. Arnold, 1976, pp 121-136.

20. Fassatiova, O., "Plisne o vlaknite houby v technicke mikrobiologii" [in Czech], Prague, SNTL, 1979, 237 pages.

21. Wainwright, M., and Killham, K., "Sulphur Oxidation by Fusarium Solani," SOIL BIOL. BIOCHEM., 1980, No. 12, pp 555-558.

22. Zonneveld, B. J., "Effect of Carbon Dioxide on Fruiting in Aspergillus Nidulans," TRANS. BRIT. MYCOL. SOC., 1988, Vol. 91, Pt 4, pp 625-629.

LASER AND NONIONIZING RADIATION

New Russian Laser Center Markets Equipment to India, Philippines

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[Article by Galina Kulikovskaya: first paragraph MOSCOW NEWS comment]

[Text] The developments of Moscow researchers lead those of their Western counterparts by 3-5 years, say experts.

About 50 posts of laser medicine have appeared in Russia over the past three years. In order to put this branch of public health (it is literally occupied by "healers" with dubious reputation) under control and ensure the professional training of physicians the Russian Federation's Ministry of Public Health has set up an All-Russia State Research Center with a training base on the basis of the Laser Medicine Research Institute.

For bloodless dissection of muscular tissue and the resection of the internal organs (kidneys, gallbladder) the medical workers of the State Centre use the Raduga-1 contact aluminium laser produced by conversion at the Moscow Polyus Scientific-Production Association. The other development project of the defence industry—the Raduga-1F laser produced by the Istok Scientific-Production Association, near Moscow, is used for endocoagulation.

Foreign businessmen are greatly interested in the work of the State Centre. In July a contract was signed on the delivery of laser equipment to India, on training Indian doctors in Moscow and on setting up a branch of the Centre in Dharwar. Negotiations are under way with the representatives of the Ministry of Public Health of the Philippines, private clinics from Paris and Madrid and the Turkish Asia Ltd, company.

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